



U.S. Environmental Protection Agency

**INTERIM CAPITAL PLANNING AND
INVESTMENT CONTROL (CPIC) PROCEDURES
FOR THE OFFICE OF MANAGEMENT AND
BUDGET (OMB) EXHIBIT 300**

INTERIM VERSION 2.6

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OFFICE OF ENVIRONMENTAL INFORMATION (OEI)



Executive Summary

The mission of the Capital Planning and Investment Control (CPIC) process at the Environmental Protection Agency (EPA) is to bring the Agency into full compliance with the Clinger-Cohen Act of 1996 (CCA), by establishing a series of structured, consistent, and repeatable processes and procedures for planning and managing its investment resources. The CCA requires that all Agencies use a three-phase, disciplined CPIC process to acquire, use, maintain, and dispose of Information Technology (IT) systems. To assist Federal Agencies in complying with these CCA requirements, the U.S. General Accounting Office (GAO) has developed an Information Technology Investment Management (ITIM) Framework that provides more specific guidance and information on the three CPIC phases mandated by the CCA – Select, Control, and Evaluate. EPA has adopted the GAO ITIM Framework, and has molded its CPIC process around its key tenets and components. In addition, OMB has set forth specific requirements with respect to CCA implementation and CPIC with which EPA must comply.

The Office of Environmental Information (OEI) within EPA has the responsibility for implementing and managing the EPA CPIC process in accordance with these requirements. Given this charge, OEI has developed a suite of policies, procedures, and guidance to assist Agency personnel in implementing CCA and defining a structured CPIC process.

This document – *Interim Capital Planning and Investment Control (CPIC) Procedures for the Office of Management and Budget (OMB) Exhibit 300* – was created to serve as Standard Operating Procedures (SOPs) to assist Agency staff in complying with the requirements of the OMB Exhibit 300 process, and incorporates many lessons learned at EPA since the enactment of CCA. It provides a wide range of detailed information on the current EPA CPIC process as well as recommended techniques, procedures, and best practices for use in preparing an OMB Exhibit 300 business case.

The document answers some of the following basic questions about the EPA CPIC Process, with a focus on the production of an OMB Exhibit 300 business case:

- **Who** is responsible for overseeing the CPIC process at EPA? Who is responsible for creating the OMB Exhibit 300 business case? Who is responsible for reviewing and approving the OMB Exhibit 300 business cases?
- **What** is the EPA CPIC process? What are its major phases and what does each entail? What procedures are to be followed in completing an OMB Exhibit 300 business case?
- **Where** do OMB Exhibit 300 business case submissions go – both within and outside the Agency? Where can you find more information on EPA CPIC policies, processes, and related topics?
- **When** does an OMB Exhibit 300 business case need to be produced, reviewed, and submitted?
- **Why** was the EPA CPIC process created? Why is it necessary/required?
- **How** should you navigate each of the three phases of the EPA CPIC process in producing an OMB Exhibit 300 business case? How should you structure your IT investments to ensure EPA and OMB approval? How should you approach each of the wide variety of topics that must be addressed in an Exhibit 300 business case?

Specifically, the document contains the following five sections:

- **Document Summary** – Describes the purpose, applicability, and structure of the document;
- **The CPIC Process** – Provides details on the mission and scope of the EPA CPIC process, pertinent background information, a process overview, and an annual calendar for the CPIC process;
- **The Select Phase** – Details the purpose, entry criteria, process, and exit criteria for the initial CPIC phase in which investments are screened, ranked, and selected;



- **The Control Phase** – Provides guidance on the purpose, entry criteria, process, and exit criteria for the second phase in the CPIC process in which investments are monitored and corrective actions are taken as necessary; and
- **The Evaluate Phase** – Describes the purpose, entry criteria, process, and exit criteria for the third phase in the CPIC process in which investments are reviewed and adjusted, and lessons learned are applied.

The document also contains a number of appendices that provide additional resources and references as well as “best practices” for a variety of topics related to the preparation of the OMB Exhibit 300, including:

- **Appendix A, References** – Details a list of references used to develop this document as well as resources for additional information on related topics;
- **Appendix B, Glossary of Terms and Acronyms** – Defines terms and acronyms used throughout this document;
- **Appendix C, Quality and Information Council Charter** – Describes roles and responsibilities of the Quality and Information Council (QIC), and its relationship to other organizations involved in the CPIC process (e.g., the Information Investments Subcommittee (IIS));
- **Appendix D, Performance Measurement** – Provides information on developing performance measures for IT investments;
- **Appendix E, Cost-Benefit Analysis and Alternative Selection** – Provides information on completing a Cost-Benefit Analysis (CBA) as well as evaluating and selecting investment alternatives;
- **Appendix F, Risk Assessment** – Provides guidance on conducting a project risk assessment for IT capital investments;
- **Appendix G, Building the Project and Funding Plan Tables** – Provides direction on how to complete the milestone tables in the OMB Exhibit 300;
- **Appendix H, Enterprise Architecture and E-Government** – Describes the Federal Enterprise Architecture (FEA) and the EPA Enterprise Architecture (EA), and discusses E-Government and the President’s Management Agenda;
- **Appendix I, Earned Value Management** – Provides guidance on conducting earned value management activities and calculations;
- **Appendix J, Conducting a Post-Implementation Review (PIR)** – Describes the purpose and content of a PIR, as well as the methodology for completing one; and
- **Appendix K, Project Management** – Provides guidance on project planning and management for IT investments.

This document, in conjunction with other EPA CPIC policies, procedures, and guidance, will help formulate a more standardized, consistent, and repeatable process for planning and managing capital investments across the Agency. Over time, these CPIC policies, procedures, processes, and guidance will lead to a portfolio of investments that best meets the mission and needs of EPA and its stakeholders.



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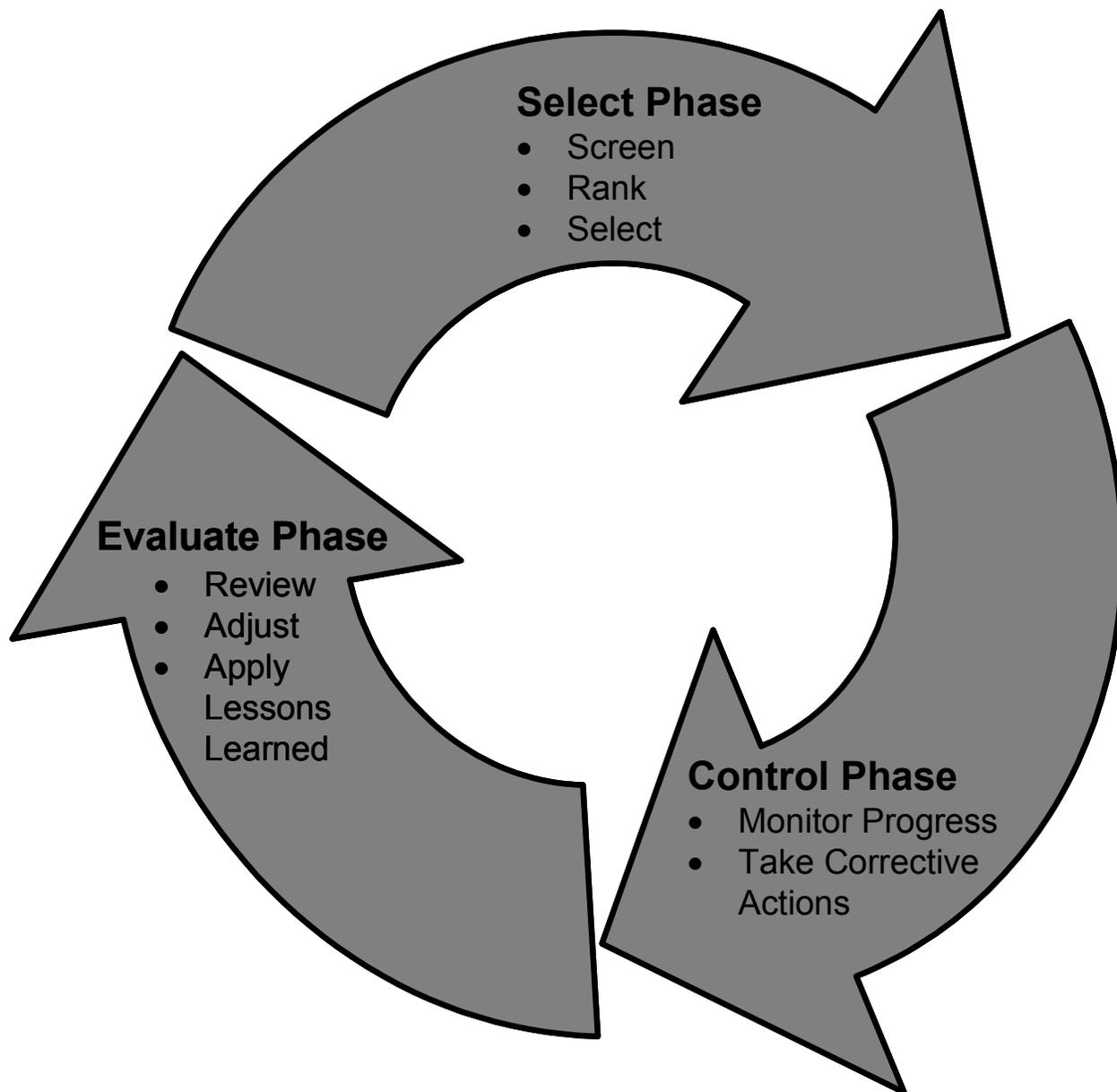
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1 Document Summary





1.1 Document Purpose

This document describes the Environmental Protection Agency's (EPA) Information Technology (IT) Capital Planning and Investment Control (CPIC) process. It documents the process that EPA staff should follow to manage an IT investment portfolio. This investment management process is mandated by the Office of Management and Budget (OMB) and the General Accounting Office (GAO), and allows EPA to optimize the benefits of scarce IT resources, address the strategic needs of EPA, and comply with applicable policies, guidance, and laws – such as the Electronic Government Act of 2002 (E-Gov) Act, the Information Technology Management Reform Act/Clinger-Cohen Act (ITMRA/CCA), and the Federal Information Security Management Act (FISMA).

These EPA *Interim CPIC Procedures for the OMB Exhibit 300* (these Procedures) are based on guidance from both the OMB and the GAO, and incorporate “lessons learned” from EPA’s iterations through the process over the last few years, and best practices of other Federal Agencies and the commercial sector¹.

These procedures provide CPIC requirements and guidance necessary for developing sound, cost-effective, and compliant IT business cases in preparation for OMB’s review and approval. They support the portfolio management approach, and address the strategic planning needs of EPA. Business cases must be prepared according to the criteria in these Procedures to ensure that they will meet OMB’s statutory requirements, and allow EPA to ensure continued investment funding to meet Agency mission goals. Business Cases that are not in good standing face serious consequences from both EPA Management and OMB. Possible repercussions include delays, reductions in future funding, and possible cancellation.

1.2 Document Application

These Procedures, and the CPIC process itself, apply to IT investments that meet the criteria of

¹ Appendix A – References, contains a variety of information on Agency, Federal, and commercial best practices for use in the CPIC process.

a “major” investment. For OMB budget reporting, all major IT investments must be reported on the Exhibit 53 and must submit a “Capital Asset Plan and Business Case,” Exhibit 300².

EPA uses the OMB’s definition of a major investment, which is a system or project that meets the following criteria:

- Requires special management attention because of its importance to agency mission goals;
- Was a major project in the current budget submission and is continuing;
- Is financial management and spends more than \$500,000;
- Ties directly to the top two layers of the Federal Enterprise Architecture (FEA) (Services to Citizens and Mode of Delivery);
- Is an integral part of the Agency’s Enterprise Architecture (EA) modernization blueprint;
- Has significant program or policy implications;
- Has high executive visibility;
- Meets EPA core CPIC criteria, standards, or requirements as a “major system” that aligns with the E-Gov strategy and E-Business solutions.

Additionally, the following must be identified as major IT investments:

- IT investments that are E-Government in nature or use e-business technologies regardless of the costs;
- IT investments that have significant multiple-agency impact;
- IT investments that are mandated by legislation or executive order, or identified by the Administrator as mission critical.

1.3 Document Structure

These Procedures are structured to follow the format of the CPIC process. CPIC is a dynamic process in which proposed and ongoing projects

² Detailed information on OMB budget reporting requirements can be found in Circular A-11 accessible via www.whitehouse.gov/omb/circulars/index.html.



are continually monitored throughout their lifecycle. Successful investments and those that are terminated or delayed are evaluated both to assess the impact on future proposals and to benefit from any lessons learned. CPIC contains three phases: Select, Control, and Evaluate. Each phase is described in a different chapter of this document, and each chapter contains the following common elements:

- **Purpose**—Describes the objective of the phase and why it is important to IT investment management;
- **Entry Criteria**—Describes the phase requirements and thresholds for entering the phase;
- **Process**—Describes the critical elements of the business case as well as the planning and review during that phase; and
- **Exit Criteria**—Describes a checklist of what must be completed and the actions necessary for proceeding to the next phase.

Important CPIC process, EPA policy, and OMB Exhibit 300 scoring tips (i.e., Strive for 5!) are highlighted in boxes.

CPIC TIP

In these boxes, the Office of Environmental Information (OEI) has identified some quick tips to make business case development and CPIC submission easier.

EPA Policy



EPA policy boxes highlight policies that must be followed during the lifecycle of the investment and the CPIC process.

Strive for 5!

Strive for 5! boxes highlight information that will ensure top scores during IT portfolio selection and the annual OMB budget submission.

These Procedures contain the following sections:

1. **Document Summary** – The purpose and scope of this document
2. **The CPIC Process** – The mission statement, the components and the workflow of the CPIC process at EPA. Details the legislative requirements that support the development of the CPIC process
3. **The Select Phase** – Process EPA uses to ensure that IT investments are chosen that best support the agency's mission and align with EPA's approach to EA
4. **The Control Phase** – Process to ensure that IT initiatives are developed and implemented in a disciplined, well-managed, and consistent fashion; that project objectives are being met; that the costs and benefits were accurately estimated; and that spending is in line with the planned budget. This promotes the delivery of quality products and results in initiatives that are completed within scope, on time, and within budget.
5. **The Evaluate Phase** – The Post Implementation Review (PIR) and Operational Analysis processes and guidance on comparing actual to expected results once a project or major component has been fully implemented; provides an understanding on how to evaluate mature systems on their continued effectiveness in supporting mission requirements and to evaluate the cost of continued support or potential retirement and replacement

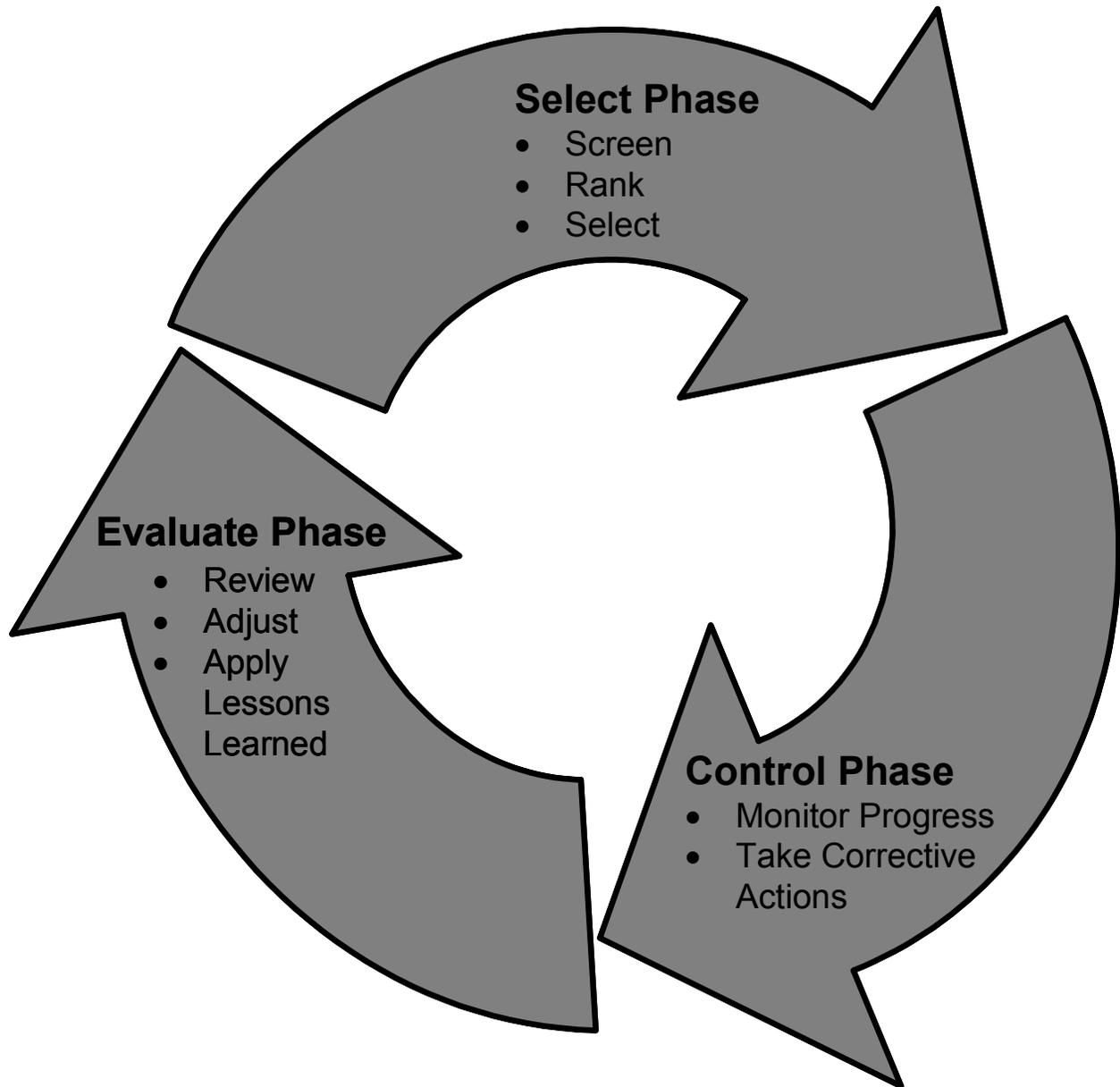


Appendices:

- 6. References** – Details a list of references used to develop this document as well as resources for additional information on related topics;
- 7. Glossary of Terms and Acronyms** – Defines terms and acronyms used throughout this document;
- 8. Quality and Information Council Charter** – Describes roles and responsibilities of the Quality and Information Council (QIC), and its relationship to other organizations involved in the CPIC process (e.g., the Information Investments Subcommittee (IIS));
- 9. Performance Measurement** – Provides information on developing performance measures for IT investments;
- 10. Cost-Benefit Analysis and Alternative Selection** – Provides information on completing a Cost-Benefit Analysis (CBA) as well as evaluating and selecting investment alternatives;
- 11. Risk Assessment** – Provides guidance on conducting a project risk assessment for IT capital investments;
- 12. Building the Project and Funding Plan Tables** – Provides direction on how to complete the milestone tables in the OMB Exhibit 300;
- 13. Enterprise Architecture and E-Government** – Describes the Federal Enterprise Architecture (FEA) and the EPA Enterprise Architecture (EA), and discusses E-Government and the President's Management Agenda;
- 14. Earned Value Management** – Provides guidance on conducting earned value management activities and calculations;
- 15. Conducting a Post-Implementation Review** – Describes the purpose and content of a PIR, as well as the methodology for completing one; and
- 16. Project Management** – Provides guidance on project planning and management for IT investments.



2 The CPIC Process





2.1 Mission Statement

The Clinger-Cohen Act (CCA) of 1996 requires that all Agencies use a three-phase, disciplined Capital Planning and Investment Control (CPIC) process to acquire, use, maintain, and dispose of Information Technology (IT) systems.

In May, 2000 the Government Accounting Office (GAO) released an exposure draft on *Information Technology Investment Management: An Overview of GAO's Assessment Framework*. This overview describes the CCA-mandated, three-phased approach for investment review and management, and a maturity model for implementing this process. This methodology is known as the "ITIM Framework". The three-phase approach includes a Select Phase, a Control Phase and an Evaluate Phase for strategically managing major IT investments that will have a material effect on Federal Agencies and subsequently the Federal Government.

The Environmental Protection Agency (EPA) has adopted the ITIM Framework of CPIC.

The mission of the CPIC Process at EPA is to bring the Agency into compliance with Public Law 104-106, the Clinger-Cohen Act of 1996.

Through the Office of Environmental Information (OEI), CPIC is centrally managed to:

1. Ensure Agency sponsorship of all IT investments;
2. Ensure alignment of IT investments with the strategic goals of EPA;
3. Ensure alignment of IT investments with the Enterprise Architecture (EA) of EPA and the Federal Enterprise Architecture (FEA);
4. Ensure that each investment has a rational, documented business case that will meet the requirements of the Office of Management and Budget (OMB) and Exhibit 300;
5. Ensure that IT investments are fairly evaluated through the development of standardized business cases;
6. Reduce the risk of investment failure by enforcing a performance-based measurement system;

7. Reduce the risk of project failure by enforcing a cross-functional integrated project team (IPT).

2.2 Legislative Background and Associated Guidance

In addition to CCA, several other statutes require Federal agencies to revise their operational and management practices to achieve greater mission efficiency and effectiveness. These laws include:

1. **The E-Government Act of 2002 (E-Gov)** requires agencies to support E-Government initiatives, cross-agency e-business opportunities, and implement performance measures for E-Government projects. The E-Gov Act requires agencies to conduct Privacy Impact Assessments (PIAs) on investments before developing or procuring information technology that collects, maintains, or disseminates information that is in an identifiable form.
2. **The Government Performance and Results Act of 1993 (GPRA)** developed the foundation by which Federal agencies measure how well initiatives are meeting mission objectives.
3. **The Federal Acquisition Streamlining Act of 1994 (FASA V)** requires that agencies establish and measure performance goals and achieve 90% of those goals, on average.
4. **The Federal Information Security Management Act (FISMA)** or Title III of the E-Government Act of 2002, requires agencies to have plans for information security programs to assure adequate information security for networks, facilities, information systems, or groups of systems, as appropriate. It also requires these plans to be reviewed annually by agency program officials and Inspector General (IG) audits of information security programs and practices.
5. **The Paperwork Reduction Act of 1995 (PRA)** requires that agencies perform information resource management activities in an efficient, effective and economical manner.



6. **The Government Paperwork Elimination Act (GPEA).** Requires agencies to provide for electronic submission of forms, including electronic signature and proper security.

7. **The Chief Financial Officer (CFO) Act of 1990 and the Federal Financial Management Improvement Act of 1996.** The OMB has policies and standards by which financial management systems should be designed, developed and operated.

Additionally, the **National Archives and Records Administration (NARA)** has recommended that electronic records related to CPIC be stored and archived (<http://www.archives.gov/index.html>). NARA has issued guidance for maintaining and disposing electronic CPIC records, which can be found on the NARA website.

These Procedures focus primarily on the CCA requirements. The CCA's objective is that senior managers use a CPIC process to systemically maximize the benefits of IT investments, by documenting compliance with applicable statutes and alignment with EA/FEA targets:

- "The Head of each executive agency shall design and implement in the executive agency a process for maximizing the value and assessing and managing the risk of the IT acquisitions of the executive agency," and,
- "The process shall:
 1. Provide for the selection of IT investments to be made by the executive agency, the management of such investments, and the evaluation of the results of such investments;
 2. Be integrated with the processes for making budget, financial, and program management decisions within the executive agency;
 3. Include minimum criteria to be applied in considering whether to undertake a particular investment in information systems. [This] criteria [is] related to the quantitatively expressed projected net risk-adjusted return on investment. [The minimum criteria should include] specific

quantitative and qualitative criteria for comparing and prioritizing alternative information systems investment projects;

4. Provide for identifying information systems investments that would result in shared benefits or costs for other Federal agencies of State or local governments;
5. Require identification of quantifiable measurements for determining the net benefits and risks of a proposal investment; and
6. Provide the means for senior management to obtain timely information regarding the progress of an investment, including a system of milestones for measuring progress, on an independently verifiable basis, in terms of cost, capability of the system to meet specified requirements, timeliness, and quality."

Beyond the legislative background, there is extensive guidance from the Federal Chief Information Officer (CIO) Council, the OMB, the GAO, and others in the area of IT investment management. A list of investment management reference guides and memos is identified in **Appendix A - References**. The policy and processes described herein are consistent with this guidance.

2.3 Scope

The CPIC process supports and documents executive decisions that ensure all IT investments support EPA's mission, vision and goals, and component agency business plans and missions.

The CPIC process is a structured, integrated approach to managing IT investments. It ensures that all IT investments align with EPA mission and support business needs while minimizing risks and maximizing returns throughout the investment's lifecycle. CPIC relies on a systematic selection, control, and on-going evaluation process to ensure each investment's objectives support the business and mission needs of the Agency.

- CPIC ***IS*** a policy and procedure of IT investment strategic management. It is



continuously performed throughout the system life cycle. For simplicity, EPA uses the Exhibit 300 format for the CPIC documentation.

- CPIC ***IS NOT*** simply the annual budget submission to the OMB. CPIC is an ongoing monitoring and evaluation process, of which the OMB submission is an output.

Through sound management of IT investments, the Information Investments Subcommittee (IIS) and the QIC determine the IT direction for EPA, and ensure that IT investments are managed with the objective of maximizing returns to the Agency and achieving business goals.

It is essential that major IT investments within EPA comply with these CPIC Procedures. These are the procedures that each Office is expected to use to manage its major IT investments. Office level CPIC processes and procedures must be at least as stringent as the OMB Exhibit 300 requirements dictate, and in compliance with these Agency-level CPIC procedures.

Major investments are considered to be strategic for the Agency and thus, have a greater documentation burden, including being individually reported to OMB on an Exhibit 300. They are also included in the Major IT Investment Portfolio. The thresholds for a project to be considered “major” are described in **Section 1.2 – Document Application**.

2.4 Strategic Management

Strategic Management builds long term success for businesses and organizations by ensuring that all perspectives, or viewpoints of an organization are considered during planning and decision-making.

The success of EPA’s IT investments directly affects the ability of Offices within EPA to execute business plans and fulfill missions. CPIC enables the Agency to view its IT investments strategically, thus ensuring they are aligned with the overall goals and objectives of the Agency.

Additionally, emphasis is placed on:

- Alignment with Agency wide EA, FEA, and support of the President’s Management Agenda (PMA);
- Project risk management;
- OMB budget submissions;
- Security;
- Privacy;
- Performance; and
- E-Gov

The long-term success of EPA is directly linked to achieving its strategic goals and objectives. The five strategic goals of EPA are:

1. **Clean Air** – Protect and improve the air so it is healthy to breathe and free of levels of pollutants that harm human health or the environment.
2. **Clean and Safe Water** – Ensure drinking water is safe. Restore and maintain oceans, watersheds and their aquatic ecosystems to protect human health, support economic and recreational activities, and provide healthy habitat for fish, plants and wildlife.
3. **Preserve and Restore the Land** – Preserve and restore the land by reducing and controlling risks posed by releases of harmful substances; promoting waste diversion, recycling, and innovative waste management practices; and cleaning up contaminated properties to levels appropriate for their beneficial reuse.
4. **Healthy Communities and Ecosystems** – Protect, sustain, or restore the health of people, communities and ecosystems using integrated and comprehensive approaches and partnerships.
5. **Compliance and Environmental Stewardship** – Improve environmental performance through compliance with environmental requirements, preventing pollutions and providing environmental stewardship. Protect human health and the environment by encouraging innovation, and providing incentives for governments,



businesses, and the public that promote environmental stewardship.

Additionally, EPA has cross-goal strategies that will contribute toward progress of the five goals described above. These strategies involve administration, financial management, legal services, and processes employed to help accomplish objectives. These strategies cover the different perspectives, or views, of the Agency.

1. Partnerships
2. Information
3. Innovation
4. Human Capital
5. Science
6. Homeland Security

Strategic management concerning IT investments at EPA is governed by the IIS and the QIC. The IIS and the QIC are chartered to review major IT investments to ensure that they will fulfill mission performance requirements at EPA, follow guidelines of the GAO and the OMB, and ensure that EPA complies with statutory regulations. See **Appendix C – QIC Charter** for more information on the roles and responsibilities of these two organizations within EPA.

2.5 Tactical Management

Tactical Management is the day-to-day monitoring of strategic objectives. For example, CPIC processes promote oversight to ensure that project management to develop the Major IT Investment Portfolio follows sound tactical management practices. Through the CPIC process, the Agency can enforce:

- Accurate budgeting and cost benefit analysis;
- Acquisition strategies that benefit the Agency;
- Project planning that emphasizes achieving milestones on time and on budget;
- Real-time corrective measures by analyzing project trends using earned value calculations.

Consistent tactical management reduces both project and strategic risks by providing project managers with proven, reusable processes and tools that enable efficient monitoring of time, vendors, and costs.

2.6 Process Overview

At the highest level, the CPIC process is a circular flow of EPA's IT investments through three sequential phases of Select, Control and Evaluate.

- **Select Phase**— Project Managers compile the information necessary for supporting a detailed proposal assessment. Executive decision-makers assess each proposed investment's support of EPA's strategic and mission needs. Investment analyses are conducted and the QIC chooses the IT projects that best support the mission of the organization, adhere to Federal and Agency security requirements, align with EPA's approach to EA, and are prepared for success.
- **Control Phase**—EPA ensures, through timely oversight, quality control, and executive review, that IT initiatives are developed and implemented in a disciplined, well-managed, and consistent manner.
- **Evaluate Phase** - Actual results of the implemented projects are compared to expectations to assess investment performance. This is done to assess the project's impact on mission performance, identify any project changes or modifications that may be needed, and revise the investment management process based on lessons learned. Mature, or steady state systems are assessed to ascertain their continued effectiveness in supporting mission requirements, evaluate the cost of continued maintenance support, assess potential technology opportunities, and consider retirement or replacement options.

Each of these three phases is structured in a similar manner using a set of common elements. These common elements provide a consistent and predictable flow and coordination of activities within each phase. The common elements are defined by the OMB-developed Exhibit 300 template. Contact OEI for the most



recent version of the OMB Exhibit 300, and question-by-question EPA guidance³.

Completing one CPIC phase is necessary before beginning a subsequent phase. Each phase is overseen by the IIS and the QIC, which ultimately approves or rejects an investment's advancement to the next phase. This ensures that each investment receives the appropriate level of managerial review and that coordination and accountability exist.

2.7 Documentation

At EPA, the CPIC process is documented and submitted to OEI and the QIC using OMB's Circular A-11, and Exhibit 300.

Table 2.1 lists all of the sections of the Exhibit 300 as of the Fiscal Year 2005 budget submission, and how the sections are emphasized, progressing through the three CPIC phases. This table offers suggestions for cascading changes. Every business case is different, so OEI will help identify how changes will affect the business plan.

2.8 CPIC Process Owner

The CPIC process is primarily supported and maintained by EPA's Office of Environmental Information. Contact OEI with questions about these Procedures or the CPIC process.

While OEI is responsible for the enterprise and portfolio process and guidance, each Office must maintain its own investment planning and management functions to fulfill CPIC goals and objectives.

At EPA, prior to submitting documentation to OEI, all business cases must be reviewed and signed by the Offices' Senior Resource Official (SRO), as part of the Offices' local CPIC process.

³ Each fiscal year (FY), there is a possibility that OMB guidance for the Exhibit 300 process will vary from the previous year's guidance. To assist Exhibit 300 preparers, EPA produces a question-by-question guidance document separate from this document, and distributes it to the preparers. It contains more specific "how-to guidance" for each OMB Exhibit 300 question than these procedures, and can be found on the OEI intranet after publication. The current version of the OMB Exhibit 300 can be found by accessing the current version of Circular A-11, via the following link:

<http://www.whitehouse.gov/omb/circulars/index.html>



Table 2.1: Exhibit 300 Sections through the CPIC Process

SECTION	DESCRIPTION	SELECT	CONTROL	EVALUATE
I.A	Project Description	Describe what the investment is	Modify the description if necessary. Major changes indicate that there will be adjustments in many sections of the document.	Modify the description if necessary. Major changes indicate that there will be adjustments in many sections of the document.
I.B	Justification	Emphasize the mission performance gap and the solution	If there are minor changes here, look for changes in the Description and Performance Goals. Major changes indicate review of Alternatives Analysis and EA and may require a kick-back to the Select phase (Select).	Indicate whether current business practices are the most advantageous and cost-effective to the Agency. If there are minor changes here, look for changes in the Description and Performance Goals. Major changes indicate a review of Alternatives Analysis and EA and may require a kick-back to Select.
I.C	Performance Goals	Develop no more than 5 ways to measure investment success.	If there are minor changes, look for adjustments in the Description and Justification section. Major changes indicate required review of Alternatives Analysis and EA, and may require a kick-back to Select.	Emphasis will be on whether the investment is meeting baseline goals. If not, analyze the variance and describe why the investment is failing to meet goals. Determine if the investment is eligible for re-design or modernization.
I.D	Program Management	List the names, roles, responsibilities and contact information of the team	Ensure the contact information is correct. If there are major changes to the Integrated Project Team (IPT), analyze project risk in the Risk Inventory.	Ensure the contact information is correct. If there are major changes to the IPT, analyze project risk in the Risk Inventory.
I.E	Alternatives Analysis	Emphasis is on developing three viable alternatives, one of which may include continuing with the "as-is" system or solution.	Any changes at this phase will be a result of a major adjustment to another section such as EA, Project and Funding Plan and Security. Most likely, the project will be kicked-back to Select.	Must be performed with a future-focus in E-Gov strategy and web services or other e-business tools. This analysis ensures that the implemented solution continues to be the best choice, and returns the greatest benefit to the Agency. Any changes at this phase will be a result of a major adjustment to another section such as EA, Project and Funding Plan and Security. Most likely, the project will be kicked-back to the Select phase.
I.F	Risk Inventory	Emphasis is on identifying risks in the 19 areas and planning how to manage those risks. Costs must be included	Minor adjustments should be well documented. Major changes may affect the entire project. Depending on the risk-type adjusted, the investment may need to go through Definition and Select again.	Minor adjustments should be well documented. Major changes may affect the entire project. Depending on the risk-type adjusted, the investment may need to go through Definition and Select again.
I.G	Acquisition Strategy	Emphasis is on performance-based contracting and spreading risk from the Agency to the contractor	Minor changes will most likely affect the Project and Funding Plan. Major changes most likely will affect the Risk Inventory as well. The project may be put on hold until project risks are mitigated.	There should be no changes to this section unless the project is going through modernization. If so, the project should enter the CPIC Select phase.



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SECTION	DESCRIPTION	SELECT	CONTROL	EVALUATE
I.H	Project and Funding Plan	If this is the first CPIC cycle for this project, only fill in table 1.H.2. If this is not the first CPIC cycle for this project and there are changes to the approved baseline, fill in tables 1.H.3 and 1.H.4.	Governance boards are looking for overruns and management issues. Minor changes will be proposed in the appropriate table, and may also affect the Risk Inventory and Acquisition Strategy. Major changes may temporarily halt funding until issues and risks are resolved.	There will be only one entry in this section for a fully implemented steady-state/operations and maintenance project. Analyze ongoing costs against budgeted costs and determine cost overruns.
II.A	Enterprise Architecture	Map the investment's components to the FEA and EPA reference models.	Minor changes should be documented. Major changes due to external factors will affect the Justification, Performance Goals and Alternatives Analysis. If the investment no longer serves the need, the investment will most likely go back through Definition and Select.	All answers must be with a focus on e-Gov strategy. The only changes in EA for steady-state/operations and maintenance projects will be if the Agency has changed its EA structure. If so, changes here may affect Justification, Performance Goals and Alternatives Analysis. Determine if the investment is still aligned with the strategic goals of the Agency, and if not, make the decision to retire the investment or modernize it.
II.B	Security and Privacy	Describe the security plan developed in the System Life Cycle (SLC) Definition phase and ensure that at least 1% of the budget is spent on security. When investments are in the initial and planning (acquire) stage, a PIA must be completed with current updates and approved annually.	Minor changes may affect the Project and Funding Plan. Major changes may affect the system Justification and possibly halt funding. When investments are in the Full Acquisition and Steady State (use) stage, a PIA must be reviewed annually but only completed every three years. An e-mail certification is required annually.	The only changes in security for steady-state/operations and maintenance projects will be if the Agency has changed its security goals and requirements. If so, changes here may affect the project plan. Determine if the investment is still aligned with the strategic goals of the Agency, and if not, make the decision to retire the investment or modernize it. When investments are in the Mixed Life Cycle (maintain) stage, a PIA is required every three years. However, a review must occur every year to ensure no substantial changes/modification have occurred that would require a new submission.



2.9 Annual Calendar

There are five different EPA areas that make up the CPIC and related budget processes. An annual calendar, with tasks, is shown below.

In March, the Program Offices turn in one-page abstracts of new IT Investments that contain a description of the investment, the spending summary, and the justification of the project to OEI.

The IIS reviews the abstracts and initially scores them as red, yellow or green. Greens will be included with the budget submission, yellows need additional justification work, and reds are immediately rejected.

From this, the IIS develops the preliminary portfolio and notifies the Program Offices that need to complete business cases for the Select phase.

Over the summer, the Program Offices, with help from the EA and CPIC Teams, and the OEI Subject Matter Experts (SMEs), develop or modify their business cases and/or Privacy Impact Assessments.

When the business cases are finalized and are submitted to OEI, the IIS will review them for inclusion in the Major IT Investment Portfolio, and forwards recommendations to the QIC. The QIC makes the final decision.

Table 2.2: EPA Budget Calendar

	BUDGET PROCESS	CPIC TEAM	PROGRAM OFFICES	IIS	QIC
Feb		Data call to Program Offices to update and revise abstracts CPIC Reviews for high-risk investments			
Mar	Annual Planning Meeting guidance issued		Respond to data call for abstracts		
Apr	Goal Meetings held	Update reporting database with Operating Plan budget numbers	Update/revise any projects scored "yellow" by subcommittee	Review and preliminary approval of draft portfolio based upon abstracts' red, yellow and green scoring	
May	<ul style="list-style-type: none"> Spring planning meeting Budget guidance issued to Agency 	Training with preparers	Ensure decisions made on preliminary portfolio development are shared with the Program Offices' resource community for budget formulation	<ul style="list-style-type: none"> Re-visit projects scored "yellow" for possible inclusion in portfolio Decisions shared with SBO's for inclusion in preliminary budget formulation 	
June	<ul style="list-style-type: none"> Proposals due to OCFO Budget forum Planning and Budget submission guidance issued. 				

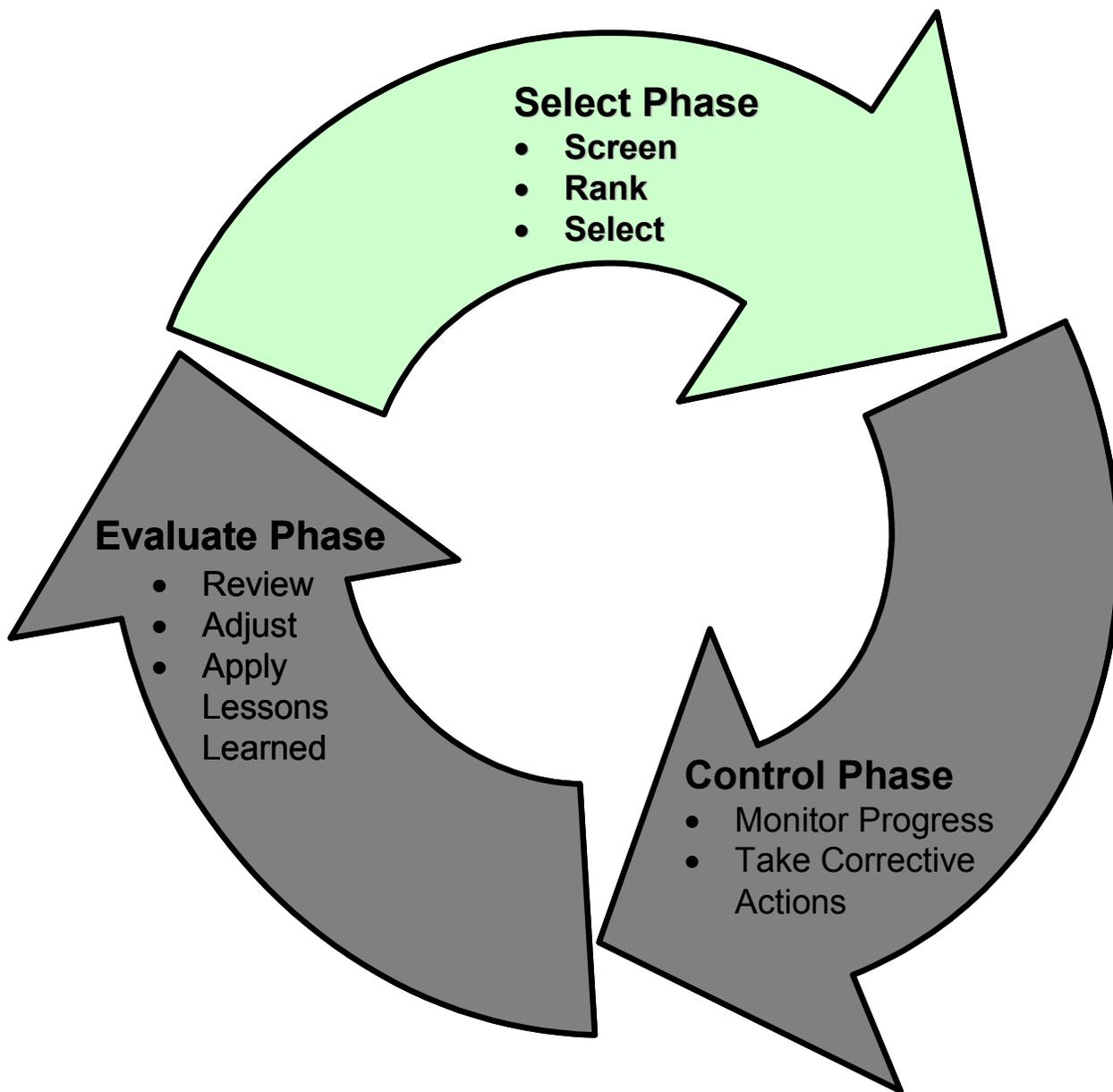


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	BUDGET PROCESS	CPIC TEAM	PROGRAM OFFICES	IIS	QIC
July		<ul style="list-style-type: none"> Interviews with preparers to help complete business cases OMB's final guidance released 	Work with CPIC and EA Teams and SMEs during interviews to help complete business cases and/or Privacy Impact Assessments	Review and give final approval of recommended IT portfolio for the QIC's approval	
Aug	Agency prepares annual plan and budget justification to OMB	Finalize business cases and reporting	Finalize business cases working with OEI staff to update reporting and prepare OMB submission	Review and give final approval of recommended IT portfolio for the QIC's approval	<ul style="list-style-type: none"> Final approval of IT portfolio Approval of sequencing plan
Sept	Annual plan and budget	Submit Exhibit 300s and Exhibit 53 to OMB			
Oct	OMB conducts budget review meetings with EPA				
Nov	OMB passback to EPA.	Updates Exhibit 300s for OMB passback			
Dec	EPA incorporates OMB passback decisions to create President's budget (PRESBUD)	Data call to provide updated actuals and revised PRESBUD figures	Update financial systems with actuals and PRESBUD numbers based on passback		
Jan	EPA completes annual plan and budget for Congress, due first Monday in February	Submit updated Exhibit 300s and Exhibit 53s to OMB for PRESBUD submission			



3 The Select Phase





3.1 Select Phase Purpose

This phase of the Capital Planning and Investment Control (CPIC) process is very important. During this phase, the sponsoring Office will define the need for the investment, explain the solution, and finalize the CPIC submission that complies with Agency and Federal planning and information requirements. In this phase, the Integrated Project Team (IPT) will need to demonstrate to the Information Investments Subcommittee (IIS) and the Quality and Information Council (QIC) that this investment is the best use of Agency funds to fill the mission performance gap, and should be included in the Agency's Investment Technology (IT) Investment Portfolio.

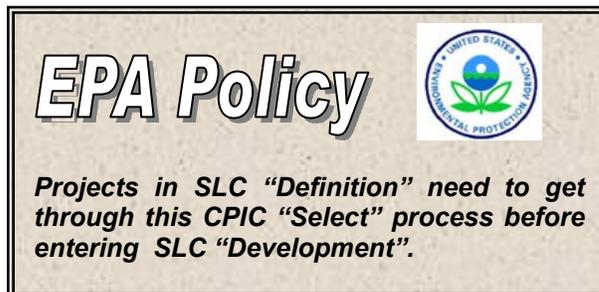
Proper planning, documentation, and review is critical not only to funding, but it also sets success expectations for this solution, and the IPT that manages it. When this business case is approved, it will be the baseline by which to evaluate the progress and performance of the investment through the remainder of its life cycle.

3.2 Entry Criteria

Prior to entering the Select Phase:

1. The IIS approved the system abstract;
2. A performance gap in mission success was identified;
3. An IPT was established to analyze solutions to fill that gap (see 3.3.4.4);
4. The IPT developed a solution through System Life Cycle (SLC) Definition, and that solution is considered a major investment. See **Appendix B - Glossary** of these Procedures for a definition;
5. A business case was developed to propose the solution for funding;
6. The business case was approved and signed by the Office's Senior Resource Official;

7. The Project Sponsor gained a funding commitment from the Office.



3.3 Select Phase Process

In the Select Phase, the Environment Protection Agency's (EPA) IT investments are screened to ensure they best support EPA's mission and target Enterprise Architecture (EA). Individual investments are ranked in terms of technical alignment and projected performance as measured by cost, schedule, benefit, and risk, against other IT systems. Milestones and review schedules are also established for each investment during the Select Phase.

Business cases developed during the Select Phase ensure that project teams have well defined business and strategic requirements, a security analysis required by the EPA System Life Cycle Management Policy and other EPA and Federal security policies and guidance, a Privacy Impact Assessment (PIA), performance measures, a cost benefit analysis, as well as completion of other project planning efforts in preparation for inclusion in the Agency's investment portfolio and movement to the Control Phase.

The IIS and the QIC review recommended investments in good standing, and select those that will be included in the Major IT Investment Portfolio. A separate meeting is held for all other investments requiring improvements prior to selection.

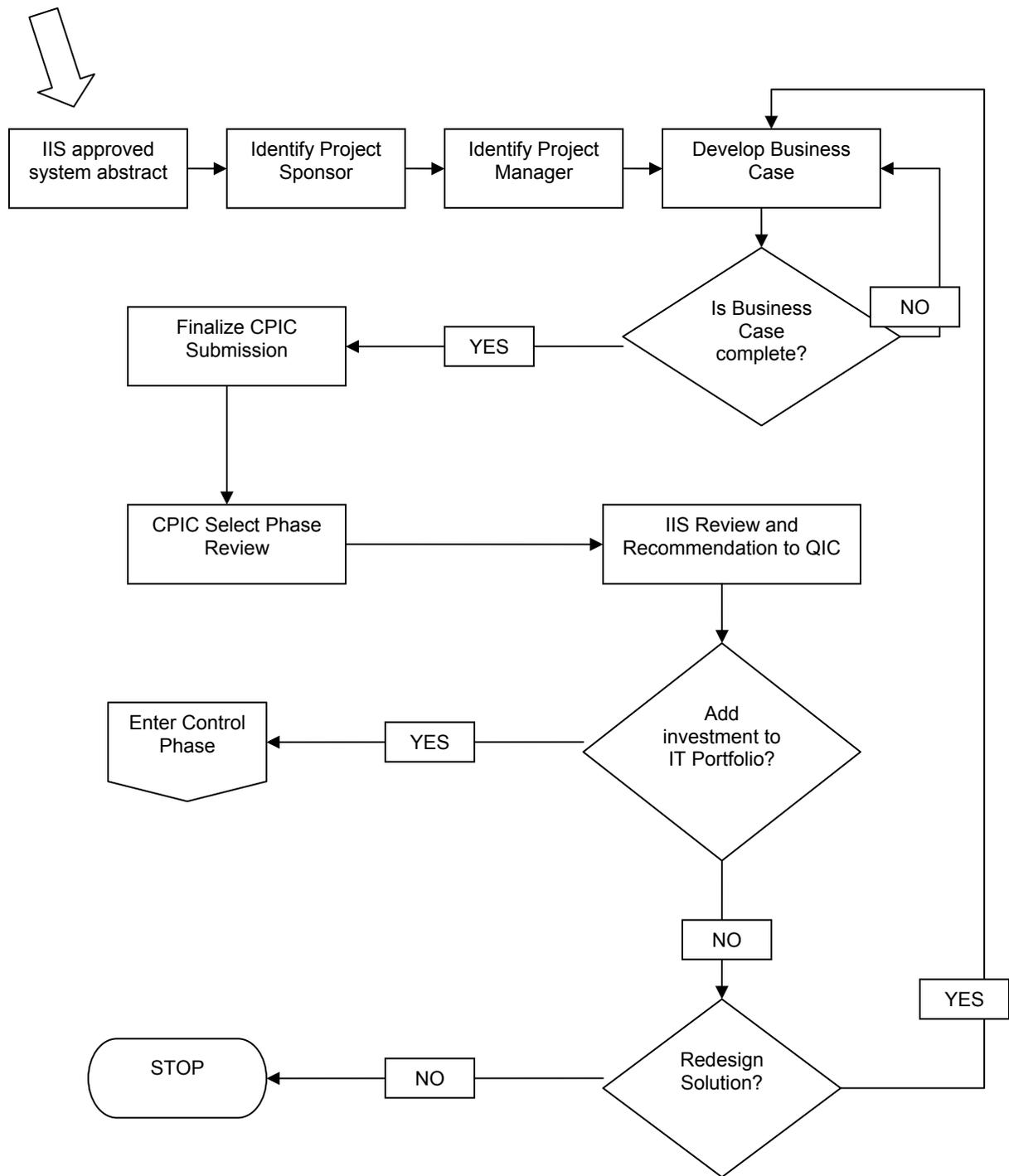


Figure 3.1. The Select Phase Decision Process Flowchart



3.3.1 IIS Approves Abstract

Developing a business case is a time-consuming and often costly process. At EPA, Offices are asked to submit a system abstract for an initial assessment prior to developing the business case. The preparation of the abstract is important, as it provides documentation that supports the later development of a more detailed business case.

An abstract is a one-page summary of the proposed system that includes a description of the system, its goals and objectives, a summary of spending, security requirements, and an EA overview.

The IIS will evaluate the proposed system solution to determine if the Office should proceed with its definition or IIS will evaluate against criteria. This process begins in March.

3.3.2 Identify Project Sponsor

The Project Sponsor should have been identified during SLC Definition Phase. The Project Sponsor should be a senior individual in the organization with requisite management, technical, and business skills to lead the investment or supervise a designated Project Manager.

Commercial and government best practices show that IT investments championed by a business leader have the best chance for successful implementation. The Project Sponsor is the business leader responsible to the IIS and the QIC for the investment as it continues through the CPIC process. The project sponsor must review the System Management Plan (SMP) and associated decision documents at each SLC phase before the system may advance to the next phase. The review and approval must be documented in the system decision documents. This commitment by the Project Sponsor to the IIS and the QIC represents accountability for the investment.

At EPA, the Project Sponsor is responsible for allocating funding, and for compliance with EA and CPIC policies and processes.

3.3.3 Identify Project Manager

The Project Manager should have been identified during SLC Definition Phase. If not, the Project Sponsor identifies a Project Manager, who will be responsible for the day-to-day operations of the system, including all necessary documentation for EA and CPIC processes and review project manager qualifications.

The Project Manager selected should possess the following qualifications:

- Three years experience managing IT projects of similar size and scope, and OEI-Sponsored 32-hour PM training; or
- PM certification, by or equivalent to the Project Management Institute (PMI) requirements, and dedication to the project on a full-time basis.

3.3.4 Develop Business Case

Business cases are a tool that the Agency uses to ensure that its IT dollars are invested wisely, and put to use in areas where the Agency's needs are greatest. They also help to ensure that the system owner has a solid plan in place for achieving results that provide mission-critical capabilities and efficiencies where they did not exist previously.

Business case development involves justifying the need for the investment by matching it to business requirements and Agency strategic goals, and showing that risk, security, cost and development have been planned for appropriately. The goal of the business case is to show the Agency that this investment is the best alternative for the Agency.

CPIC TIP

Start with the work you've already done in your System Management Plan. Then prepare your CPIC submission by using the Exhibit 300 format to focus your attention on required elements.



EPA uses Exhibit 300 from OMB circular A-11 as the documentation for the business case⁴. All parts of the Exhibit 300 will need to be filled in during the Select Phase of the CPIC process. Start with the work already done in the System Management Plan to avoid conflict and duplication of effort. SLC policy states that in the Definition Phase, the system team must:

1. Define an EPA business need;
2. Document the purpose, scope and requirements of the proposed information system; and
3. Begin security planning and develop a security risk assessment and PIA.

The next section will describe the different sections of the Exhibit 300, and will provide a description of what needs to be documented.

Please refer to Table 2.1: Exhibit 300 Sections through the CPIC Process in **Section 2 - CPIC Process** to see what should be emphasized in each section of the Exhibit 300 for the Select Phase.

3.3.4.1 Project Description

The project description summarizes the investment from a user and technical perspective. Describe who the customer is, what the need is, and what the system solution is. The Description is a summary of the business case.

Describe the system assumptions, such as:

- What other Agency departments will this system rely on?
- What are the data and process inputs that the system requires to function properly?

CPIC TIP

It may be easier to write the description last, highlighting the main points of your business case.

⁴ OMB Exhibit 300 guidance can be found in section 300 of the current year's Circular A-11 at <http://www.whitehouse.gov/omb/circulars/>

The description may include support for assumptions such as user interview documentation, process diagrams (showing touch-points between departments), data diagrams, etc.

3.3.4.2 Justification

The justification will begin with a performance gap analysis to identify mission gaps in EPA's strategy. A performance gap analysis is a forward-looking and continuous analytical activity that evaluates the capacity of the Agency and/or the Agency's assets to satisfy existing and emerging demands for services.

Examples of potential needs include those related to economic and demographic trends, statutory requirements, or an industry-developed technological opportunity.

The Project Sponsor determines how analysis should be conducted to validate, quantify, and prioritize the proposed need by challenging the IPT to "think outside the box". It is important to have a functionally diverse project team that will provide different perspectives to this strategic analysis. The types of questions the team can ask itself are:

- What are the strengths, weaknesses, opportunities and threats to the Agency that have resulted in this performance gap?
 - Identify and quantify projected demand for services based on input from diverse sources such as: state and educational communities; architecture and strategic plans; and performance and supportability trends of established systems. Identify the affected user and customer bases.
- What are the Agency's goals, and the organizational pains that will prohibit those goals from being reached?
- Does the Agency have the organizational capacity to fulfill its goals now and in the future?
 - Identify and quantify projected technological opportunities that will enable EPA to perform its mission more efficiently and effectively.



- o Identify and quantify the need for existing and projected services based on information from field organizations, the EA, and IT investment portfolio that defines what is in place and what is approved for implementation.

Strive for 5!

A higher priority will be placed on investments that are directly related to E-Gov initiatives. See the latest release of the E-Gov strategy to see if yours does! http://www.whitehouse.gov/omb/egov/site_map.htm

The justification should clearly describe either the capability shortfall and the impact of not satisfying the shortfall on customers and stakeholders or the technological opportunity and the increase in efficiency it will achieve. Do this by describing how the investment will help achieve EPA's strategic goals. The justification also must describe the criticality and timeframe of the need, and roughly estimate the resources the Agency should commit to resolving it based on worth, criticality, and the scope of likely changes to the Agency's IT Investment Portfolio. This information forms the basis for establishing the priority of this need in competition with all other Agency investments.

Strengthen the need for this system by including research and statistics.

Strive for 5!

Higher scores will be awarded to business cases that show a direct relationship between the investment and mission needs, and specifically, how performance measures can influence the achievement of mission-critical strategic goals.

3.3.4.3 Performance Goals and Measures

The Government Performance and Results Act (GPRA) provides a mandate to federal agencies to account for program results through the

integration of: strategic planning, budgeting, and performance measurement. GPRA requires agencies to prepare strategic plans, annual performance plans, and annual performance reports that linking program effectiveness with expenditure of funds. Performance goals and measures are a critical part of the investment's business case, and provide a baseline by which to evaluate its success.

Performance goals are the objectives of the system. Goals should be designed with all layers of EA in mind: Business, Data and Information, Service Component, Technology, and Performance.

Describe goals as targets – for example: The new help desk application will track issue resolution time with 95% accuracy within three years of implementation. The targets can be graduated, for example the new help desk will provide 80% accuracy in the first year, 90% in the second year and 95% in the third year.

The Project Sponsor will facilitate developing quantifiable performance measures that focus on outcomes. See **Appendix D - Performance Measurement**, provide examples to develop and write Performance Goals and Measurements.

Strive for 5!

Higher scores will be awarded to business cases that describe both the baseline and target performance goals and measures. Describe how you will achieve the target measures for that extra point!

The Project Manager is responsible for documenting the goals and measurements in a format for CPIC review. Be sure to include baseline trends for comparison to new targets.

3.3.4.4 Program Management

The Program Office IPT represents expertise from functional areas as required by the specifics of the investment. In addition to the functional experts on the team, a Capital Planning Analyst from the Office of



Environmental Information (OEI) will provide guidance to the IPT throughout the CPIC process.

The IPT should, at a minimum, consist of functional experts in the following areas:

- Project Sponsor with program experience
- Project Manager who will oversee the day-to-day operations of the project and investment
- IT Manager with experience in the proposed technology
- Security Specialist
- Agency Budget Analyst
- Contracting Specialist
- Program Office Architect
- Stakeholders or Collaborating Partners

Additional staff may be added from other functional areas as needed. These people may serve on multiple IPTs.

EPA Policy



All EPA information system development projects must have a documented, designated Project Sponsor and Project Manager. See the EPA Interim Agency System Life Cycle Management Policy, Interim EPA Order # 2100.4 (http://intranet.epa.gov/rmpolicy/ads/orders/2100_4.pdf) for the latest requirements.

Include the roles, qualifications and contact information for all members of the IPT in the CPIC documentation to show that the IPT represents all functional areas affected by the investment.

3.3.4.5 Alternatives Analysis

The business case provides the necessary information to build support and make funding decisions for an investment. In order to convince the IIS and the QIC that this solution is the best, an Alternatives Analysis with costs and benefits must be completed

Strive for 5!

Higher scores will be awarded to business cases with three viable alternatives that were consistently compared, and have well documented assumptions.

Alternative One should be status quo – what are the costs if the system is not developed? Alternatives Two and Three should be selected as viable technical and business approaches. Refer to the Federal EA Reference Models for potential alternatives. One area to consider is the use of EPA WCF services or acquired specialized hardware services external to the Agency. Develop a life-cycle for each alternative and the costs and benefits for each element involved in those life-cycles.

Examples of cost elements are:

- Hardware including depreciation
- Software including releases
- Development Costs
- Program Costs
- Operations and Maintenance

Cost data can be collected from a variety of sources such as:

- Historical Agency Databases
- Current System Costs
- Market Research
- Publications

CPIC TIP

If you're having trouble finding actual cost information, contact your Agency Budget Analyst for standard rates.

Analyze the benefits that the alternatives will provide in both quantitative and qualitative terms. Sometimes the cheapest alternative isn't the best so don't immediately preclude alternatives due to cost constraints!



High returns on investment may be awarded to more expensive solutions that provide the most qualitative benefits such as: most improved mission performance in accordance with GPRA; increased quality of data; increased flexibility and responsiveness to stakeholders; and increased employee satisfaction. Quantify these benefits and include them in the CBA of the selected alternative. The cost benefit analysis (CBA) must be risk-adjusted, meaning that the probability of the risk occurring was taken into consideration when calculating project costs. Discount the annual costs to calculate the net present value of the investment, and identify in what year the investment will break even. Use the current discount rates (DRs) published by the OMB. Contact OEI for help finding the correct rates.

The important thing to remember is that each alternative must be compared in a consistent manner, and if it isn't (for example, using contractors for development of one alternative and employees for the development of another), the reason for the difference must be clearly explained. "We have the capability in-house to develop Alternative Two, we don't for Alternative Three."

Select the best alternative after weighing all of the factors and describe the reasons why it was selected. Also include the reasons why the other two alternatives were not selected. The IIS and the QIC want to be able to evaluate the methods and reasons for chosen alternative.

Refer to **Appendix E – Cost Benefit Analysis and Alternative Selection** for more information on how to complete this section of the documentation.

3.3.4.6 Risk Inventory

The OMB requires that a risk inventory and assessment is completed for all major IT investments, and that risk is actively managed. Many projects fail because risks, both obvious and hidden, aren't identified and planned for.

The first thing to know is that there is no way to eliminate risk completely. The focus of a Risk Inventory in the CPIC Select Phase is to identify risks and plan how to manage risks to an appropriate level in order to protect invested funds. The OMB requires the Risk Inventory to

cover the 19 risk types listed below. See **Appendix F – Risk Assessment**, for more information.

1. *Schedule* – the project schedule slips.
2. *Initial Costs* – Actual costs exceed estimates.
3. *Life-cycle Costs* – Actual costs exceed estimates.
4. *Technical Obsolescence* – The technology chosen becomes outdated prior to the end of the life-cycle, and the return on investment isn't realized.
5. *Feasibility* – The selected alternative is wrong.
6. *Reliability of Systems* – The system doesn't meet uptime standards and expectations.
7. *Dependencies and interoperability between this system and others* – Success of this investment relies heavily on the success and continuation of other systems.
8. *Asset Protection* – The investment is difficult to protect, for example it is located in an unsecured building.
9. *Risk of Creating a Monopoly for future procurements* – The investment relies on one contractor for operations and maintenance, so costs cannot be controlled through procurement procedures.
10. *Management Capability* – The Program Offices do not have the capacity to manage the investment and surrounding processes and systems.
11. *Risk of Failure* – The investment has a high probability of not closing the mission gap and will not return the benefits expected.
12. *Organizational and Change Management* – Employees are resistant to learning new processes and accepting the new investment.
13. *Business* – Decision to develop and implement the investment is a bad business decision.
14. *Data/Information* – Success of the investment relies heavily on accurate data and information.
15. *Technology* – Success of the investment relies heavily on technology components.



- 16. *Strategic* – The investment will not close mission performance gaps.
- 17. *Security* – Protected data may be compromised. Classify the risks here as high, medium or basic.
- 18. *Privacy* – Data contained in the system is regulated by privacy laws and requires special planning.
- 19. *Project Resources* – The development of the system relies heavily on specific project resources, or required resources are scarce.

In the documentation, describe how each risk type will potentially affect the project. If the risk type will not affect the project or investment, describe why. Think about the ways that risks can be managed, such as “Security risk will be managed by conducting periodic security reviews”, or “The project will be managed by a PMI certified Project Manager”. Include the date the risk was identified and the probability of occurrence.

The risk plan should include milestones and target dates for each risk mitigation strategy. In the Risk Inventory, describe what milestones need to occur until the risk is adequately managed.

3.3.4.7 Acquisition Strategy

A smart acquisition strategy can help mitigate many of the project risks discussed in the previous section. If using contractors to develop the system, EPA promotes the use of fixed price or performance-based contracts to help spread schedule and cost risk away from the Agency and onto the contractor.

The IPT’s Contracting Officer can provide advice to help establish a contracting strategy that will mitigate risk to the government while utilizing performance-based contracts.

Strive for 5!

Higher scores will be awarded to projects with performance-based or fixed price contracts. Work with your Contracting Officer to develop the best contract for your project.

The use of pre-packaged components over custom programs usually reduces the amount of time to implementation, and also alleviates small programming bugs and testing issues.

Also, the acquisition strategy must allow for a solution that is Section 508 compliant. Section 508 of the Rehabilitation Act of 1973 requires that federal agencies develop, procure, maintain or use electronic and IT that is accessible to federal employees and citizens with disabilities.

3.3.4.8 Project and Funding Plan

Project milestones are submitted as part of the business case as baseline expectations of the project costs and schedule. They will be approved by the IIS, the QIC and the OMB and will serve as the project baseline to help monitor performance success of the development and implementation. Once approved, these milestones should not change without approval from the IIS, the QIC and the OMB. See Appendix G – Building the Project and Funding Plan Tables, for examples on how to correctly fill in the tables.

Transfer the milestones of the project plan into Exhibit 300 as part of the CPIC submission. Required information for the Select Phase are the milestone descriptions, projected start and end dates with calculated duration in days, and the planned cost for each milestone. If this is a multi-agency project, identify the agency that is responsible for funding each milestone.

The plan must be tracked using a performance-based tool that meets American National Standards Institute/Electronic Industries Alliance (ANSI/EIA) Standard 748. Standard 748 is more of a process than a program, and organizes 32 project management criteria that focus on cost, schedule and performance goals into five main areas:

- Organization
- Accounting
- Revisions and Data Maintenance
- Planning, Scheduling and Budgeting
- Analysis and Management Reports

In the Select Phase, EVMS isn’t required, but historical information should be collected and tracked for future reporting and use. Make sure



the tools are in place for retaining project management data.

3.3.4.9 Enterprise Architecture

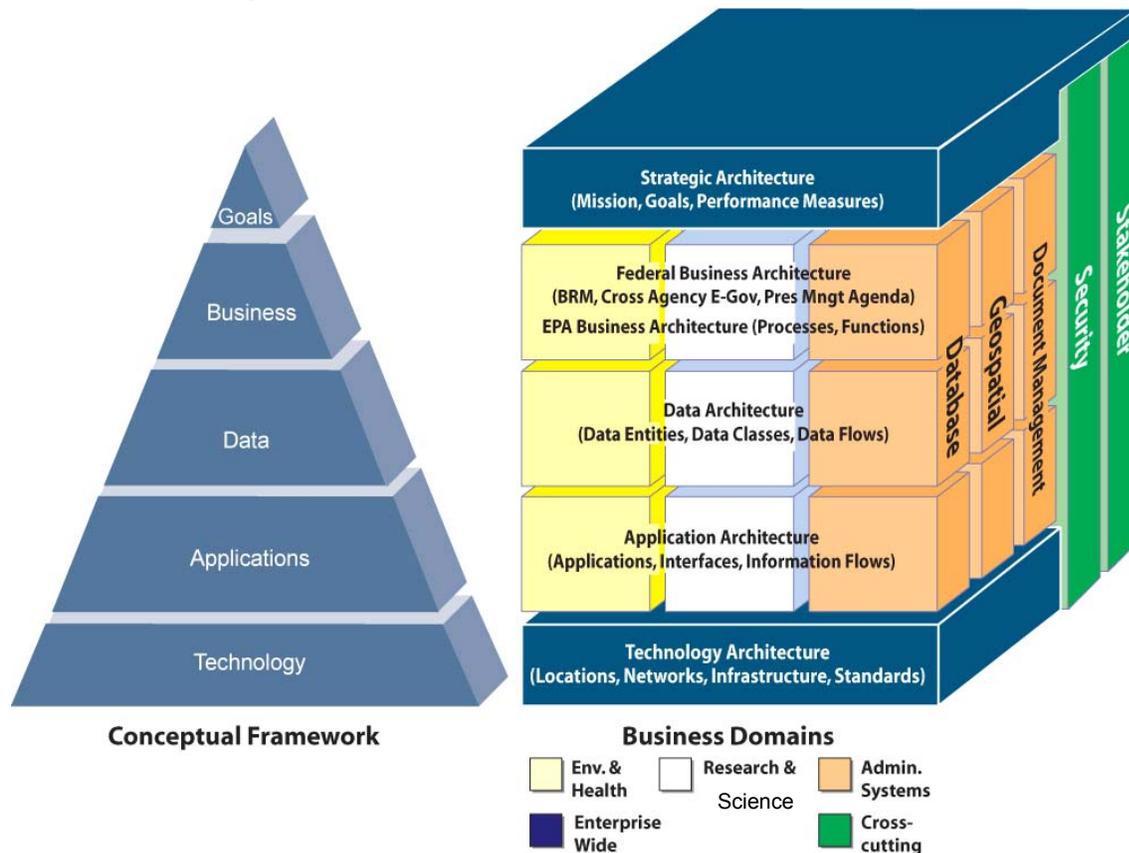
The CPIC process emphasizes alignment of the investment with Federal and Agency architectures. The IIS, the QIC, and the OMB will rate investments that closely map to the reference models higher than those that do not. Investments that don't map to the architecture reference models are at risk of losing funding.

Enterprise Architecture analysis will review the alignment of proposals to the EPA and Federal Enterprise Architectures.

To learn more about EPA's EA, reference the strategic documentation or engage the Program Office Architect on the IPT staff. Contact the Offices' EA personnel or the EA team at OEI for more help. There is also a web page on the EPA intranet that contains information on the EPA EA, accessible via the following link: <http://intranet.epa.gov/architec>.

Appendix H – Enterprise Architecture and E-Government of this document discusses EA, the President's Management Agenda and E-Government.

Figure 3.2. EPA's Enterprise Architecture (EA) Framework



The IIS and the QIC will evaluate the new solution against alternatives to determine if it is the most viable solution that encompasses all layers. If not, the solution may need to be redesigned before the investment is approved.

Answers to the following questions will help determine if the investment solution has been adequately planned:

- Does the solution support core/priority mission functions that need to be performed



by the Agency and the Federal Government?

- Have business process efficiencies been considered as part of the solution?
- Does the solution provide opportunities for interfaces or system-sharing with other Agencies?
- Does procurement for the solution take advantage of enterprise-wide IT acquisition contracts?

Strive for 5!

To score a 5, each component of the investment must be mapped to the FEA's Reference Models. See Appendix H— Enterprise Architecture and E-Government for more information.

- Does the solution support work processes that have been simplified or otherwise redesigned to reduce costs, improve effectiveness, and make maximum use of commercial-off-the-shelf (COTS) technology?
- Does the solution align with Agency standards for EA Planning, Security & Privacy, and E-Government Planning?

3.3.4.10 Security and Privacy

EPA's System Life Cycle policy states that a comprehensive, baseline security plan is completed during the system's Definition Phase. The security plan involves identifying security risks to data (including privacy standards) and assets, while controlling security costs.

CPIC TIP 

Security spending must be at least 1% of your total IT investment budget.

Currently, management of data and information within EPA is decentralized. Each Office will

have its own policies on the type of security that is required for its investments. When developing the security plan, be sure to follow the Office's policies as well as the criteria required by the System Life Cycle process. The CPIC requirement at EPA is that security spending must be at least 1% of the total budget.

Security risks should be listed and described, with corresponding mitigation strategies. Cost of the mitigation strategies should include alternatives with the best solution selected and reasons given for the selection.

The E-Government Act of 2002 requires agencies to conduct Privacy Impact Assessments (PIAs) on investments before developing or procuring information technology that collects, maintains, or disseminates information that is in an identifiable form. In addition, any information in an identifiable form permitting the physical or online contacting of a specific individual, if identical questions has been posed to, or identical reporting requirements imposed on, 10 or more persons, other than agencies, instrumentalities, or employees of the Federal Government.

The PIA is a process for examining the risks and ramifications of collecting, maintaining and disseminating information in identifiable form. It provides a framework for considering the privacy implications of information collected on individuals and where potential disclosure risks may lie. Privacy issues must be addressed when systems are being developed and privacy protections must be integrated into the development life cycle of automated systems. Privacy concerns should always be considered when requirements are being analyzed and decisions are being made about data collection, usage, storage, and system design.

The PIA is commensurate with the size of the information system being assessed, the sensitivity of information that is in an identifiable form in that system, and the risk or harm from unauthorized release of that information.

3.3.5 Finalize CPIC Submission Package

Review the completed business case and supporting documentation based upon procedural documentation provided by OEI each



year. Make sure all of the areas that the QIC and the OMB rate highly are covered. A few extra minutes could mean the difference between a funded project, and a postponed project. Note that projects that provide insufficient business case documentation will not be included in the IT Investment Portfolio nor forwarded to the OMB as part of EPA's IT funding request.

3.3.6 CPIC Select Phase Review

In this step, the business case submission will be reviewed for accuracy and completeness in:

1. CPIC process steps;
2. Whether it is the best solution available for the requirements;
3. Whether it is well documented in the right format and all supporting documentation is included.

First, OEI reviews the business case to ensure that all process steps have been completed. OEI provides any comments and/or questions to the IPT through the contact information supplied with the submission. That contact person works with the OEI to address the issues and furnish details as requested.

When complete, OEI forwards the updated package to the QIC, who will rely on the IIS to provide a thorough business case review in accordance with Select Phase criteria. All business cases must be as thorough as possible to ensure that they can be ranked fairly against each other in the next step.

The IIS then forwards its investment recommendation to the QIC for its final decision.

3.3.7 IT Investment Portfolio Decision

The QIC is responsible for building an IT portfolio with investments that complement each other and Agency goals. The QIC will review the IIS' recommendation and consider placing this investment into its portfolio by focusing mainly on overall risk tolerance of the Agency and how this investment fits into that risk tolerance. The QIC will also consider how the investment enables the Agency to reach its strategic goals.

Here are some more points that the QIC may use in their overall IT portfolio evaluation:

- Is the investment alternative consistent with Agency EAs by integrating work processes and information flows with technology to achieve the Agency's Strategic Goals; reflect the Agency's technology vision and specify standards that enable information exchange and resource sharing?
- Is the investment alternative being proposed because no alternative in the private sector or government can support the function more efficiently?
- Does the investment ensure that security is built into and funded as part of the EA and in accordance with OMB policies?
- Does the investment reduce risk by avoiding or isolating custom-designed components, use fully-tested pilots, simulations or prototype implementations?
- Does the investment's project plan establish clear measures and accountability for project progress and have secure buy-in by users and stakeholders?
- Does the investment acquisition strategy appropriately allocate risk between the Agency and the contractor (if used), effectively use competition, tie contract payments to accomplishments and take maximum advantage of commercial technology?

If the QIC approves the investment, the decision is implemented and a review schedule for the Control Phase will be established in concert with the OEI and the IIS.

3.3.8 Funding

At EPA, the Project Sponsor and Project Manager are responsible for obtaining funding through Office level budgeting and funding sources and processes. CPIC submissions for the Select Phase should not be submitted until this commitment is obtained.

Secured funding at the Office level does not guarantee that the project will be approved for the IT Investment Portfolio. The QIC has the final say in whether the investment will be selected for the Portfolio, and presented to the OMB.



3.4 Exit Criteria

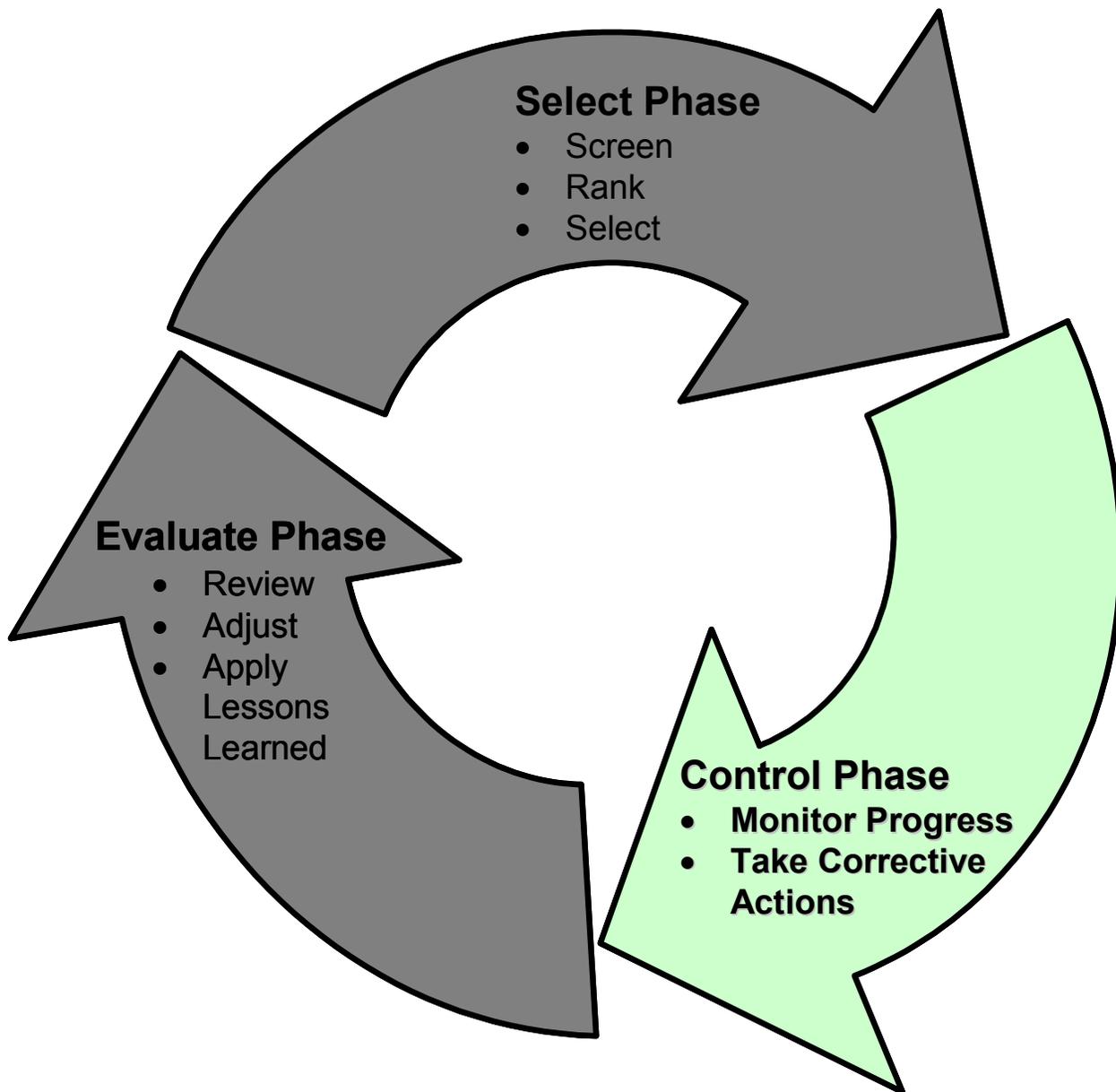
Prior to exiting the Select Phase, investments must have:

1. Identified business needs for the investment;
2. Established performance goals and quantifiable performance measures;
3. A fully developed project plan that details quantifiable objectives including an acquisition schedule, project deliverables, and projected costs;
4. A diversified IPT that represents all functional areas of the Agency that are impacted by the investment;
5. Identified costs, schedule, benefits, and risks;
6. Established security, and architecture goals and measures;
7. A fully Aligned Privacy Impact Assessment
8. Obtained Office-level funding commitments;
9. Been selected for the IT Investment Portfolio.
10. Obtained the QIC's approval to enter the Control Phase.

Projects that aren't selected can be resubmitted at subsequent reviews.



4 The Control Phase





4.1 Control Phase Purpose

The objective of the Control Phase is to ensure that the acquisition, development and implementation of investments is done in a controlled manner, on time, and within budget. Emphasis is placed on the Project and Funding Plan. Additionally, investments should be closely tracked against the various components identified in the Risk Inventory and Assessment developed in the Select Phase. Corrective actions are proposed if the project is off-schedule.

Although the Environmental Protection Agency (EPA) usually selects new investments annually, the Control Phase is an ongoing activity. It requires the continuous monitoring of ongoing Information Technology (IT) initiatives through the development and implementation lifecycle. Additionally, periodic summary reviews are completed based on the review schedule completed during the Select Phase.

The Control Phase results in a decision to continue, modify, or terminate a program. This decision is based on reviews at key milestones during the program's development lifecycle.

The focus of these reviews is on the investment's progress through development and implementation, as costs and benefits change. Reviews focus on schedule and performance goals being met; risks being minimized and managed; and whether the investment will continue to meet Agency goals and strategic needs.

Depending on the review's outcome, decisions may be made to suspend funding or make future funding releases conditional on corrective actions.

4.2 Entry Criteria

Prior to entering the Control Phase:

- Investments must have a completed Exhibit 300 approved by the Office's SIRMO;
- Passed through the Information Investments Subcommittee (IIS) and Quality and Information Council (QIC) reviews;

- The investment is part of the IT Investment Portfolio, and has received funding.

Once the investment enters the Control Phase, the Integrated Project Team (IPT) will monitor the investment throughout development and report the investment's status to its sponsors and oversight groups.




Major Investments in SLC “Development and Implementation” need to get through this CPIC “Control” checkpoint before entering SLC “Operations and Maintenance.”

4.3 Control Phase Process

During the Control Phase, an investment progresses from acquisition to implementation. The Office of Environmental Information (OEI) and the Project Sponsor provide the IIS and the QIC with investment reviews to assist them with portfolio management. Issues may be either project-driven or compliance-driven.

Project-driven issues are those that are caused by the investment itself.

- Was there an error in planning?
- Was the right alternative selected?
- Has the acquisition strategy changed?
- Was the original project and funding plan accurate?

Compliance-driven issues are caused by external factors.

- Have user requirements changed?
- Are there externally driven risks that have affected the Risk Inventory and plan?
- Has the Agency's Enterprise Architecture (EA) been modified?
- Have the Agency's strategic goals changed?

The following flowchart shows the process of the Control Phase.



4.3.1 Review and Modify Business Case

The most efficient way to prepare the Capital Planning and Investment Control (CPIC) submission is to use the Exhibit 300 developed during the last CPIC cycle, and it is recommended that preparers utilize this prior year template until the current year's template is available. This document should complement the System Lifecycle documentation, and is designed to effectively summarize and communicate the points in which OEI and the QIC are most interested.

While all sections of the Exhibit 300 must be reviewed, in the Control Phase, monitoring activities and sections such as the Project and Funding Plan and Risk Inventory and Assessment sections are emphasized.

Refer to the table in **Section 2 - CPIC Process** to identify which sections are emphasized and how changes in one section may affect other sections.

4.3.1.1 Project Description

While this section isn't as heavily emphasized in the Control Phase as it is in the Select Phase, revisit the description submitted during the previous CPIC cycle to see if there are any changes from a user and technical perspective.

4.3.1.2 Justification

The justification section of the business case aligns the reason why the agency should invest in the system with the business requirements. It justifies the cost of the investment.

When monitoring the investment during this phase, the Project's Sponsor and Manager should evaluate the assumptions made during the Select phase to ensure that the inputs that the investment will rely upon will continue to be available throughout its life. Changes in assumptions may require modifications to design or to performance goals. Make sure that the changes are thoroughly cascaded throughout the project plan, System Life Cycle (SLC) documentation and Exhibit 300.

The following questions should help in determining if there are changes in the project description.

- Have the customers changed?
- Will the solution continue to satisfy their needs?
- Will those originally relying upon outputs from this system continue to do so?
- Are there any changes to the required data and process inputs? How will those changes affect this investment?
- Have the strengths, weaknesses, opportunities and threats to the Agency that have resulted in this critical need changed?
 - Revisit and quantify projected demand for services identified during the Select Phase. If new sources have surfaced, complete the same analysis as was done during the Performance Analysis step. It is important to maintain the same level of detail and analysis, ensuring that the baseline can be consistently evaluated.
- Does the Agency still have the organizational capacity to fulfill its goals now and in the future?
 - Identify and quantify projected technological opportunities that will enable EPA to perform its mission more efficiently and effectively.
 - Identify and quantify the need for existing and projected services based on information from field organizations, the EA, and IT investment portfolio that defines what is in place and what is approved for implementation.

If the justification has weakened, the investment may need to be re-designed, or development terminated.

4.3.1.3 Performance Goals and Measures

Performance goals are the objectives of the system. These goals should be designed with all layers of EA in mind: Strategic Business, Data, Applications, and Technology. Describe goals as targets – for example: The new help desk application will track issue resolution time



with 95% accuracy within three years of implementation.

Performance measures are used to measure accomplishments and link results to objectives, and to help quantify results.

During the Select Phase, the emphasis was on developing performance goals and measures that focused on the outcomes of the solution. In the Control Phase, the Project Sponsor reviews the analysis during the previous CPIC submission and determines if it still applies to the investment in the current environment.

If there are changes to the project assumptions, justification or description, the Project Sponsor should look for resulting modifications to performance goals. Be sure to keep the baseline targets and fully describe any changes. Use **Appendix D – Performance Measurement** to help guide the evaluation.

If there are no changes to the Performance Goals and Measures, describe that a thorough review of the current goals and measures was completed, explain the review process, and conclude that nothing that indicates modification.

CPIC TIP

The Control Phase emphasizes project monitoring. Be sure to explain how you conducted your review as the QIC and OMB will want to see that it was thorough.

4.3.1.4 Program Management

In the Select Phase, the IPT was identified and contact information was submitted as part of the CPIC documentation. This point of the CPIC process is a good time to evaluate the team. Does the skill mix still contribute toward development of the investment? Does the project still have representation from required functional areas? Is the project being adequately managed? Do the team members have adequate time to provide input to the project?

On the Exhibit 300, provide the names and contact information of the project team, as well as their skill sets and responsibilities.

If there are changes to the project team, be sure to take a close look at the project’s Risk Inventory plan for potentially negative effects. Describe the evaluation process and document if there are changes and why.

CPIC TIP

If there is a change in the IPT, OEI will look for effects to the Risk Inventory. Be sure to look for project risks due to changes in the IPT.

4.3.1.5 Alternatives Analysis

During the Control Phase, continue to evaluate alternatives to ensure that the current solution is the best. If there’s a change, the sponsoring office, in addition to OEI, will need to determine if it is material enough to push the investment back to the Select Phase. If so, development and funding will stop while the investment goes back through the SLC Definition phase and a new business case is developed.

4.3.1.6 Risk Inventory

The focus of the Risk Inventory and Assessment in the CPIC Select Phase was to identify risks and plan how to manage risks to an appropriate level. The Control Phase places a heavy weight on the Risk Inventory monitoring plan and process.

The process described below will help guide the Risk Inventory and Assessment.

1. Begin with the Risk Inventory prepared during the previous CPIC cycle – this is the baseline.
2. With the IPT, identify any new or existing internal risks based upon review of the Work Breakdown Structure (WBS), Project Plan, Risk Checklist, and stakeholder interviews. Financial, technical, operational, schedule, legal and contractual, and organizational risks should be identified and monitored.



3. Gather the analysis conducted on all of the sections of the Exhibit 300 during this CPIC cycle and create a new Risk Inventory by following the same process as before. Be sure to consider the same types of risk, which are listed below for review:

1. Schedule
2. Initial Costs
3. Life-cycle Costs
4. Technical Obsolescence
5. Feasibility
6. Reliability of Systems
7. Dependencies between this system and others
8. Asset Protection
9. Risk of Creating a Monopoly for future procurements
10. Management Capability
11. Risk of Failure
12. Organizational and Change Management
13. Business
14. Data/Information
15. Technology
16. Strategic
17. Security
18. Privacy
19. Project Resources

See **Appendix F – Risk Assessment**, for an in-depth approach to identifying and planning for the risks listed above.

4. Conduct a GAP analysis between the baseline and the new Risk Inventory. Are there any changes? If so, what are the effects of these changes? How do the changes affect:

- Risk Priority
- Risk Description
- Probability of Occurring
- Cost to Mitigate the Risk
- Cost to the Agency if the Risk Occurs

5. Finally, be sure to update the plan for this CPIC submission.

4.3.1.7 Acquisition Strategy

In the Select Phase, an acquisition strategy was selected to help mitigate many of the project risks identified in the previous section. During the Control Phase, the acquisition strategy should be reviewed for changes in contractors, price and deliverables if the contract is performance-based.

Review the project and funding plan first, then meet with the Contracting Officer if changes to the project plan will result in changes to previously negotiated contracts.

If there are changes to the acquisition strategy, the QIC and OMB will look for related changes to the Project and Funding Plan, as well as the Risk Inventory.

4.3.1.8 Project and Funding Plan

This section is the most important section of the CPIC submission for the Control Phase.

During the Select Phase, the Project Manager translated the milestones of the project plan into the Exhibit 300 as part of the CPIC submission. During the Control Phase, the Project Manager will need to thoroughly analyze the development of the investment and measure the project plan against the baseline submitted during the Select Phase. The baseline submitted during the Select Phase cannot be modified in the Exhibit 300 unless approved by the QIC and OMB.

The plan must be tracked using a performance-based tool that meets ANSI/EIA Standard 748. Standard 748 is more of a process than a program, and organizes 32 project management criteria that focus on cost, schedule, and performance goals into five main areas:

- Organization
- Accounting
- Revisions and Data Maintenance
- Planning, Scheduling and Budgeting
- Analysis and Management Reports



To ensure that the project has been planned realistically, key personnel and Subject Matter Experts (SMEs) for functional areas should be identified and labor costs quantified.

CPIC TIP
American National Standards Institute/ Electronic Industries Alliance (ANSI/EIA) Standard 748 is a process that emphasizes earned value management. When tracking schedule and costs you CANNOT adjust your CPIC-approved baseline!

A project plan with a WBS and milestones was developed during the SLC Definition Phase and approved through CPIC Select Phase. During the Control Phase, collect actual information on the resources allocated and expended since the beginning of the project. Gather analysis conducted on the other sections of the business case to ensure that the investment is still aligned with the business case submitted during the previous CPIC submission.

For consistency, use the gap analysis conducted during review of the other Exhibit 300 sections to identify changes to the project plan.

All changes to the investment and project plan baseline are considered “proposed” until they are approved by the QIC and OMB. Be sure to document the reasons for the changes, referencing changes in other sections of the Exhibit 300 such as EA, or Security, or Performance Goals.

Strive for 5!
Accurately recording your baseline milestones and actual time and costs will ensure a higher score in this section. If you have questions, contact OEI.

Refer to **Appendix G – Building the Project and Funding Plan Tables** for a description on how to complete the tables.

The next part of planning for the project is to complete Earned Value Management (EVM) activities using an earned value management system (EVMS). EVM allows the Project Manager, the QIC, and the OMB to predict how much the investment will cost and how long it will take to develop and implement, taking cost and schedule slippages into consideration. The EVMS is an approved method to help complete the analysis.

Based on the project’s historical cost and schedule trend, calculate how the historical trend will affect the remainder of the project. The primary purpose of this assessment is to ensure that the project is on schedule, and to help identify issues or deficiencies that require corrective action. See **Appendix I – Earned Value Management** for a detailed description of how to complete this section.

This section is becoming more and more important to the IIS, the QIC and the OMB, so compliance is mandatory. If there is no EVMS in place for the project, or if there’s a lack of historical data to use, contact OEI for alternatives.

Strive for 5!
Correctly providing EVMS data will ensure top scores for this section. EVMS is becoming more and more important to QIC and OMB so compliance is mandatory. If you don’t have the data or tools for your calculations, contact OEI.

Establish whether the Estimate at Completion (EAC) is on track with original assumptions. If there are variances, plan and submit corrective actions. If the variances are greater than 10%, the project team must provide corrective actions to help justify if the project should continue. In some instances, where the business justification may no longer exist or be as strong, or if significant changes to the cost, schedule, and



technical baselines are required, the investment may need to be redesigned. This course of action will send the project back to SLC Definition and CPIC Select.

CPIC TIP

Investments with a cost or schedule slippage of greater than 10% must provide a justification and corrective action strategy to bring it back to the original baseline.

4.3.1.9 Enterprise Architecture

The investment should go through an EA review. Reference EPA's strategic documentation, engage the help of the program office architect or OEI for the policy and procedure. Summarize the results of the architecture review in the Exhibit 300. **Appendix H – Enterprise Architecture and E-Government** provides a tutorial on how to complete a review.

If the investment has not been through a formal architecture review since its last CPIC submission, go through each of the questions listed on the Exhibit 300 and objectively answer each one. Map the investment components to the FEA Reference Models. If there are changes to the investment identified in other sections, be sure to flow those changes through to the architecture.

Refer the latest E-Government documentation to ensure an accurate review. Reference **Appendix H – Enterprise Architecture and E-Government** for descriptions of how the two topics relate.

Changes to the architecture may indicate modifications to the investment and resulting adjustments to the Risk Inventory. Be sure to review performance goals and measures to set performance expectations during these changes.

4.3.1.10 Security and Privacy

During the Select Phase, the baseline security plan was identified and approved. At this point in the CPIC process, that baseline plan needs to be re-assessed, with corresponding mitigation

strategies modified if necessary. Be sure to reflect any modifications to the security plan and/or Privacy Impact Assessment (PIA) due to changes to the investment identified in other sections of the Exhibit 300. Costs of the mitigation strategies should include alternatives, the best solution selected and reasons for the selection given.

CPIC TIP

Remember, security spending must be at least 1% of your total budget.

4.3.2 Finalize CPIC Submission Package

EPA allows CPIC submission using the Exhibit 300 of the A-11. Contact OEI for the most recent version.

Review the completed business case and supporting documentation, making sure all of the areas that the QIC and the OMB rate highly are covered. A few extra minutes could be the difference between a funded project and a cancelled project. Projects with insufficient business case documentation will not be included in the IT Investment Portfolio or forwarded to the OMB as part of EPA's IT budget request.

When finished, submit the documentation first to the Budget Office for signatures of its Senior Budget Official, Senior Information Resource Management Official and Senior Resource Official, then submit the business case to OEI. Be sure to provide contact information when submitting the business case to OEI.

4.3.3 CPIC Control Phase Review

In this step, the business case submission will be reviewed for accuracy and completeness in:

1. CPIC process steps
2. Whether the project is in trouble – meaning there is a > 10% variance in cost and schedule



First, OEI reviews the business case to ensure that all process steps have been completed. OEI provides any comments and/or questions to the IPT, through the contact information supplied with the submission. That contact person works with the OEI to address the issues and furnish details as requested.

Next, OEI forwards the updated package to the QIC who will rely on the IIS to provide a thorough business case review in accordance with Control Phase criteria. If the project is troubled, the IIS will evaluate that the corrective measures suggested are valid and comply with Agency risk tolerances. The IIS then develops recommendations for the QIC to make a decision on whether to this project should continue.

4.3.4 Evaluate go/no-go decision

During this step, the QIC determines if the project should continue, be modified, or cancelled.

If the project is meeting assumptions and there are no foreseeable issues before the next CPIC submission, the initiative continues in the Control Phase.

If the project is troubled, the QIC will evaluate the IIS' recommendation and answers to the following questions to determine if the project can be modified or be cancelled.

- Is the IPT representative of all functional areas affected by the project? Are they fully engaged?
- Is the Project Sponsor engaged? Is the Project Manager experienced and skilled with troubled projects?
- Have there been organizational or environmental changes that will significantly affect project progress?
- Are the corrective measures proven?
- Does the acquisition strategy spread risk to hired contractors? Is the contract performance-based? Are they working to meet deadlines?
- Does the mission performance gap still exist? Is the investment still a viable

solution? Have there been material changes in the technology selected?

- Are the requirements and work scope constantly changing?
- Have the performance goals changed materially? Will the solution still deliver expected benefits and help the Agency achieve its strategic goals?
- Does the project have good data for EVM? Does the data show that project slippage can be absorbed during the remainder of the project?
- Is the Risk Inventory complete? Are current risks identified and are the mitigation plans well thought? Are the mitigation plans viable?

If the QIC agrees with the modification, a revised review schedule is established in concert with OEI and the IIS. This formal monitoring of investment progress, and the determination of risks and returns, will continue throughout the Control Phase.

If the QIC cancels the project, the QIC will determine if the project should be re-designed in SLC Definition. An investment that still has strategic value will most likely go back to Definition. An investment without strategic value will most likely have its funding stopped at this point.

4.3.5 Funding

During the Select Phase, the Project Sponsor and Project Manager secured a funding commitment from the Office for the life of the investment.

If there are any funding issues, raise them with their funding office and Senior Resource Official (SRO).

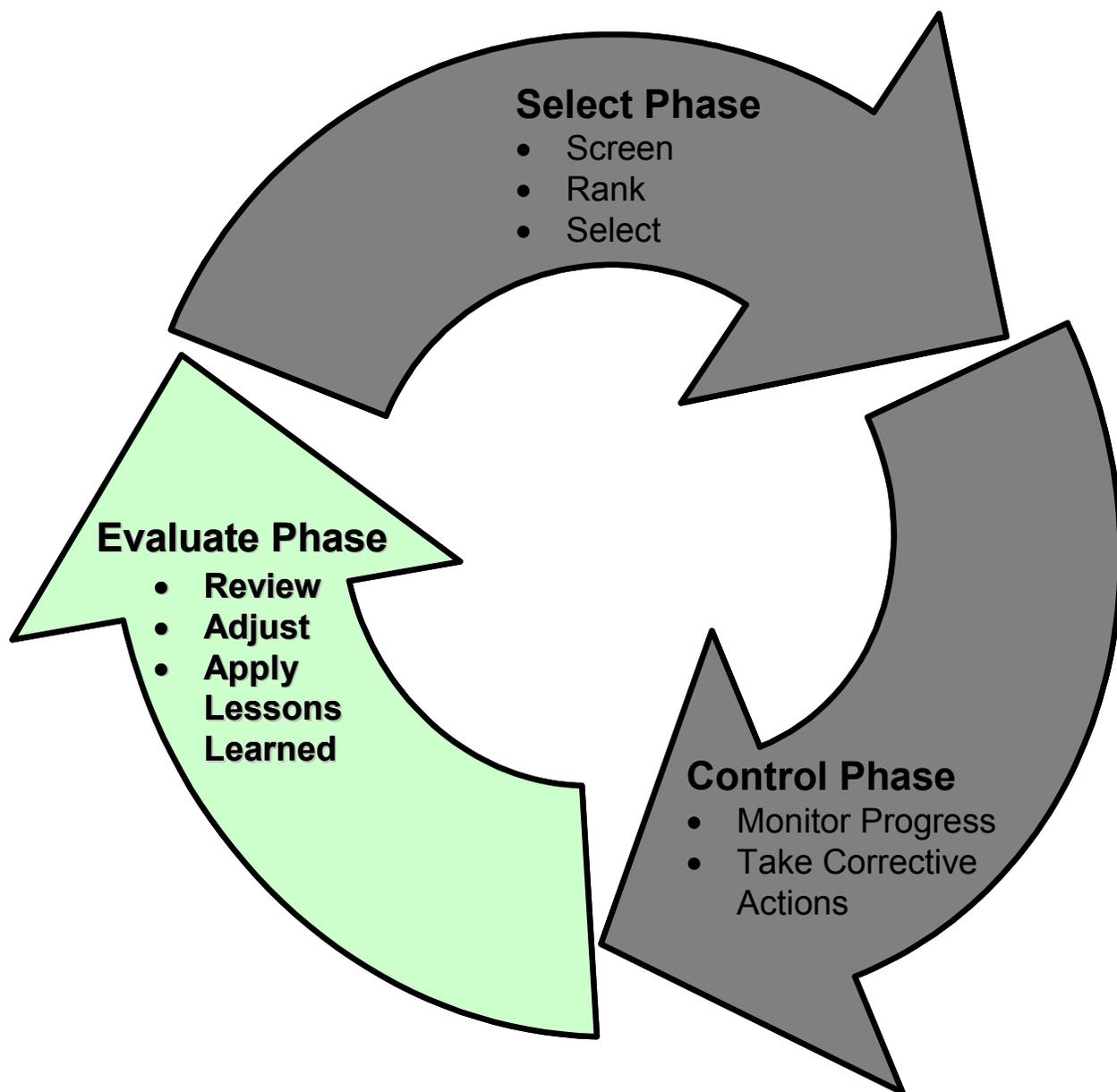
4.4 Exit Criteria

Prior to exiting the Control Phase, investments:

- Are fully developed, tested and implemented
- Have shown that they will deliver the benefits projected
- Obtained the QIC's approval to enter the Evaluate Phase



5 The Evaluate Phase





5.1 Evaluate Phase Purpose

As noted in the Government Accounting Office's (GAO) *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-Making*, "the Evaluation Phase 'closes the loop' of the Information Technology (IT) investment management process by comparing actuals against estimates in order to assess the performance and identify areas where decision-making can be improved." This is done to assess the investment's impact on mission performance, identify any investment changes or modifications that may be needed, and measure benefits to the Agency.

The Evaluate Phase focuses on outcomes:

- Determine whether the IT investment met its performance, cost, and schedule objectives;
- Ascertain the continued effectiveness in supporting mission requirements and evaluate the cost of continued maintenance support;
- Consider potential retirement or replacement of the investment;
- Determine the extent to which the Capital Planning and Investment Control (CPIC) process improved the outcome of the IT investment.

Outcomes are measured one of two ways:

1. If the project is newly implemented, by completing a Post-Implementation Review (PIR)
2. If the project is considered in System Life Cycle (SLC) "Operations and Maintenance" phase, or "Steady-State", by completing an Operational Analysis

A PIR is mandated by the Office of Management and Budget (OMB) and is conducted by an independent party (i.e., contractors or a different Integrated Project Team (IPT) or an ad-hoc project team of Environmental Protection Agency (EPA) employees), to enforce objectivity. Recommended guidance states that the IPT actively assist the PIR team. The PIR team begins by collecting performance data and comparing actual to projected performance to determine the system's efficiency and effectiveness in meeting performance and financial objectives. It includes a methodical

assessment of the investment's costs, performance, benefits, documentation, mission, and level of stakeholder and customer satisfaction. The PIR should be conducted within six to eighteen months of full implementation.

The OMB also requires that all investments in the Operations and Maintenance phase of their system life cycle have an Operational Analysis conducted in accordance with the Capital Programming Guide issued in 1997. See **Appendix A – References** for a web link to this guide.

An Operational Analysis is defined as "[a tracking method of] the system to measure the performance and cost of an operational asset against the baseline established in the Planning Phase. This information will allow agency resource managers to optimize the performance of capital assets. Additionally, operational analysis may indicate the need for the acquisition of a new capital asset. The system established should have the capability to provide simple, easy to understand information that can be used by managers to make sound management decisions." In this case, the activities conducted during the Planning Phase are the same as those that are conducted during the CPIC Select Phase.

EPA feels that by thoroughly analyzing the investment for the CPIC Evaluate phase, an Operational Analysis is conducted, as the desired results of the Operational Analysis and the CPIC Evaluate phases are the same.

5.2 Entry Criteria

Before entering the Evaluation phase, an investment:

- Has been implemented, becomes operational, or goes into production;
- Was cancelled prior to implementation. A PIR must be conducted on all cancelled projects to determine what went wrong;
- Has a confirmed PIR schedule, if applicable;
- Is in the Operations and Maintenance phase of the System Life Cycle;
- Obtained the QIC's approval to enter the Evaluate Phase.



5.3 Evaluate Phase Process

During the Evaluate Phase, fully operational investments are continually monitored for stability, performance, outages, maintenance activities, costs, resource allocation, defects, problems, and system changes. If the investment is newly implemented, a PIR must be completed within six to eighteen months of implementation. Waiting six months after implementation will provide enough test data. Waiting after eighteen months increases the risk of spending money on an investment that is not meeting the Agency's performance gaps.

During the PIR, actual performance collected is compared to performance projections made

during the Select Phase. If the variances are greater than 10%, the Quality and Information Council (QIC) will determine if the Agency should continue to fund the investment and carry out correcting modifications.

Once the investment enters the Evaluate Phase, the IPT will monitor the investment through annual Operational Analyses (or, completing the Exhibit 300 during the CPIC cycle), and report investment status to the investment's sponsors and oversight groups.

The following flowchart shows the process of the Evaluate Phase.



5.3.1 Conduct PIR and Present Results

The PIR is usually scheduled by the Information Investments Subcommittee (IIS) and the QIC during the Control Phase. For a newly deployed initiative, the PIR should take place between six and eighteen months after the system is operational to provide time to gain performance information. In the case of a terminated system, it should take place immediately because the review will help define any “lessons learned” that can be factored into future IT investment decisions and activities. See **Appendix J – Conducting a Post Implementation Review** for instructions.

The PIR should be conducted by a team who is independent of the system ownership. Either an independent consulting company can be hired to conduct the review, or an IIS team designated by the QIC can conduct it. Members of the IPT can assist.

At the heart of the PIR is the IT investment evaluation in which the Agency looks at the impact the system has had on customers, the mission and program, and the technical capability. The IT investment evaluation focuses on three areas:

1. **Impact to stakeholders**—The evaluation team typically measures the impact the system has on stakeholders through user surveys (formal or informal), interviews, and feedback studies.
2. **Ability to deliver the IT performance measures (quantitative and qualitative)**—The system’s impact to mission and program goals is carefully evaluated to determine whether the system delivered expected results. This information is compared to the investment’s original performance goals.
3. **Ability to meet baseline goals**—The following areas are reviewed to determine whether the investment is meeting its baseline goals:
 - **Cost**—Actual lifecycle costs to date;
 - **Return**—Actual lifecycle returns to date;

- **Funding Sources**—Actual funds received from planned funding sources;
- **Schedule**—Original baseline and actual initiative schedule;
- **Architectural Analysis**—Determine whether the initiative supports the Agency’s approach to EA standards or what modifications are required to ensure initiative compliance outside the original architectural baseline;
- **IT Accessibility Analysis**—Determine whether the initiative addresses accessibility for persons with disabilities, how the requirements were managed, and impact on the architecture;
- **Risk Analysis**—Identify initiative risks and how they were managed or mitigated, as well as their effects, if any; and
- **Systems Security Analysis**—Identify initiative security risks and how they were managed or mitigated as well as security performance measures.
- **Privacy Impact Analysis**—Identify privacy risks and how they were managed or mitigated.

After the post-implementation data has been collected and reviewed, the PIR team and the Project Sponsor prepare and present a formal PIR presentation to the IIS and the QIC. If the review has resulted in a variance of greater than 10% from the original baseline, the initiative may need to be re-prioritized in light of changing business, organizational, financial, or technical conditions. The presentation should summarize the investment evaluation and provide a summary of recommendations.

5.3.2 Review and Modify Business Case

Each investment in the Evaluate Phase will be assessed during the annual investment review to ensure that it should continue to receive funding. This assessment is also called an Operational Analysis. See **Appendix B – Glossary of Terms and Acronyms** for a definition of Operational Analysis.



Additionally, investments in the Evaluate Phase that are considered Steady State must go through an E-Government strategy review to demonstrate alignment with and support of E-Government initiatives. To prepare for the annual investment reviews, start with the Exhibit 300 that was submitted during the last CPIC cycle, and analyze and modify the sections as needed for this cycle. Refer to the table in the CPIC Process section to identify which sections are emphasized and how changes in one section may affect others.

5.3.2.1 Project Description

Revisit the description submitted during the previous CPIC cycle to see if there are any changes from a user and technical perspective. In monitoring the investment during this phase, the System's Owner and Manager should evaluate the assumptions made during the previous submission to ensure that the inputs the investment will rely upon will continue to be available throughout its life.

Changes in assumptions may require modifications to design or to performance goals. Make sure that the changes are thoroughly cascaded throughout the project plan, SLC documentation and Exhibit 300. As in the previous submission, don't go into too much detail, this really is a summary of the business case.

5.3.2.2 Justification

During the Operations and Maintenance phase of the SLC, the System's Owner and Manager need to evaluate the performance analysis and investment justification presented in the earlier CPIC submissions. Relevant questions are the same as in the Control phase, with a new emphasis on customer satisfaction and cost-effectiveness.

The following questions should help in determining if there are changes in the project description.

- Have the customers changed?
- Will the solution continue to satisfy performance requirements?

- Will those originally relying on outputs from this system continue to do so?
- Are there any changes to the required data and process inputs? How will those changes affect this investment?
- Have the strengths, weaknesses, opportunities and threats to the Agency that have resulted in this critical need changed?
 - Revisit and quantify projected demand for services identified during the previous cycle. If new sources have surfaced, complete the same analysis as was done during the performance analysis step. It is important to maintain the same level of detail and analysis, ensuring that the baseline can be consistently evaluated.
- Have Agency goals, and the organizational pains identified during the previous cycle changed?
- Does the Agency still have the organizational capacity to fulfill its goals now and in the future?
 - Identify and quantify projected technological opportunities that will enable EPA to perform its mission more efficiently and effectively.
 - Identify and quantify the need for existing and projected services based on information from field organizations, the EA, and IT investment portfolio that defines what is in place and what is approved for implementation.
- Were user/customer assessments conducted using tools such as surveys and community inputs? Are customers and stakeholders happy with the results of the system and will they continue to support it?
- Were costs accurately estimated? Is the investment on budget and will it continue to be?
- Does the investment comply with E-Government initiatives?
- Has there been a significant increase in the number, type, or category of individuals about whom records are maintained? Increases attributable to normal growth should not be reported.



- Did a change occur that expands the types or categories of information maintained?
- Did a change that alters the purpose for which the information is used?
- Will this require a change to equipment configuration (either hardware or software) that creates substantially greater access to the records in the system of records?

If the justification has weakened, the investment may need to be re-designed, modernized, or retired.

5.3.2.3 Performance Goals and Measures

In the Evaluate phase, performance goals are heavily analyzed. Success or failure of the investment is based on how well it performs against expectations. Are the customers and stakeholders satisfied with the product and service that they are receiving? Is the Agency recognizing the benefits it expected? Is the Federal Government getting the return on investment that was estimated?

Evaluating the performance of the investment is a continuous job. Additionally, the performance goals and measures themselves need to be analyzed; Do the measures need to be adjusted to reflect changes in customer requirements? Are they truly representative of the overall environment and system that the investment operates in? Are they difficult to track?

There are various tools and methodologies available to help analyze performance measures. Refer to **Appendix D – Performance Measures** as a guide to industry best practices. For more information on industry best practices and the best way to evaluate the investment, contact the Office of Environmental Information (OEI).

The evaluation may result in design modifications or alterations to the investment. In this case, the redesigned component will enter SLC Definition phase, and CPIC Select. Additional funding needs to be reviewed by the QIC to determine if the change to the investment

will continue to result in the highest returns to the Agency. Contact OEI for guidance on how to submit the business case.

CPIC TIP

Performance evaluation may result in the redesign of a system component. This part of the investment will need to go through CPIC Select and Control until it is implemented, and the project becomes “Mixed Life-Cycle.”

If there are no changes to the Performance Goals and Measures, describe that a thorough review of the current goals and measures was conducted, explain the review process, and conclude that no modification is needed.

5.3.2.4 Program Management

This point of the CPIC process is a good time to evaluate the team. Does the skill mix still contribute toward development of the investment? Does the project still have representation from required functional areas? Is the project being adequately managed? Do the team members have adequate time to provide input to the project?

If there are changes to the project team, be sure to take a close look at the project’s Risk Inventory plan for potential negative effects. Describe the evaluation process and document if there are changes and why.

CPIC TIP

If there is a change in the IPT, OEI will look for effects to the risk management plan. Be sure to look for project risk effects due to IPT weaknesses, and document your process.



On the Exhibit 300, provide the names and contact information of the project team, as well as their skill sets and responsibilities.

5.3.2.5 Alternatives Analysis

Alternatives Analysis for Steady State investments in the Evaluate Phase focuses on E-Government strategy and review, ensuring that the investment uses emerging technology.

Every year, the IPT should conduct an Alternatives Analysis to ensure that the investment is functioning using the most cost-effective and modern technologies and processes. The E-Government review should evaluate e-business technologies and web services such as XML, J2EE and .Net. These technologies enable seamless data sharing and collaboration across different operating systems. Refer to the FEA Technical Reference Model as a resource for emerging technologies that the Federal Government uses in its EA.

Investments that will continue to provide performance benefits may qualify for the Agency's modernization blueprint and specially allocated funds.

CPIC TIP

The investments with the strongest business justification will be awarded funding in the year they qualify for modernization so be sure to continue with thorough business case review and analysis.

5.3.2.6 Risk Inventory

During the Evaluate phase, risks are monitored for external influences such as changes in the IPT, changes in technology, changes to EA or changes in Agency leadership or funding.

Follow the process used during the Control Phase, now concentrating on external pressures. The process is repeated below.

1. Begin with the Risk Inventory prepared during the previous CPIC cycle – this is the baseline.

2. With the IPT, identify any new or existing internal risks based upon review of the Work Breakdown Structure (WBS), Project Plan, Risk Checklist, and stakeholder interviews. Financial, technical, operational, schedule, legal and contractual, and organizational risks should be identified and analyzed.
3. Gather the analysis conducted on all of the sections of the Exhibit 300 during this CPIC cycle and create a new Risk Inventory by following the same process as before. Be sure to consider the same types of risk, which are listed below for review:
 1. Schedule
 2. Initial Costs
 3. Life-cycle Costs
 4. Technical Obsolescence
 5. Feasibility
 6. Reliability of Systems
 7. Dependencies between this system and others
 8. Asset Protection
 9. Risk of Creating a Monopoly for future procurements
 10. Management Capability
 11. Risk of Failure
 12. Organizational and Change Management
 13. Business
 14. Data/Information
 15. Technology
 16. Strategic
 17. Security
 18. Privacy
 19. Project Resources
4. See **Appendix F – Risk Assessment**, for an in-depth approach to identifying and planning for the risks listed above.
5. Conduct a GAP analysis between the baseline and the new Risk Inventory. Are there any changes? If so, what are the effects of these changes? How do the changes affect:



- Risk Priority
- Risk Description
- Probability of Occurring
- Cost to Mitigate the Risk
- Cost to the Agency if the Risk Occurs

6. Finally, be sure to update the plan for this CPIC submission.

5.3.2.7 Acquisition Strategy

In the Select Phase, an acquisition strategy was chosen to help mitigate many of the project risks identified in the previous section. Even if the investment is fully implemented and is operational, contractor teams involved in day-to-day operations and maintenance need to be evaluated during this CPIC phase.

Review the project and funding plan first, then meet with the Contracting Officer if changes to the project plan will result in changes to previously negotiated contracts.

If there are changes to the acquisition strategy, the QIC and OMB will look for related changes to the Project and Funding Plan, as well as the Risk Inventory.

5.3.2.8 Project and Funding Plan

Review the ongoing funding plan to determine if costs have been estimated correctly. Make budgeting adjustments if the original costs have not been estimated correctly.



Projects with a cost slippage of greater than 10% must go through a special OEI review outside the normal CPIC schedule, and may lose funding.

A variance of greater than 10% will require a special OEI review. Use Earned Value Management (EVM) software to calculate estimates at the completion of the project. Provide explanations on why the investment has a cost overrun, and plan corrective actions. Be sure to include the original cost estimates for comparison. The goal of this section as part of the Evaluate Phase is to provide enough information to the IIS and the QIC so that they may decide whether to continue the investment as is, modify, or retire it.

Changes to the tables due to modification will be submitted as part of Select.

5.3.2.9 Enterprise Architecture

During the Evaluate phase, the investment is assessed against the Agency Enterprise Architecture (EA) to ensure that it continues to comply with the EA and any E-Government initiatives or strategies. If the investment has not been through a formal architecture review since its last CPIC cycle, go through each of the questions listed on the Exhibit 300 and objectively answer each one. Map the investment components to the Federal Enterprise Architecture (FEA) Reference Models and the EPA EA. If there are changes to the investment identified in other sections, be sure to inform to the EA Team.

Refer the latest E-Government documentation to ensure accuracy. Reference **Appendix H – Enterprise Architecture and E-Government** for descriptions how the two topics relate.

Changes to the architecture may indicate modifications to the investment. Be sure to review performance goals and measures to set expectations during these changes.

5.3.2.10 Security and Privacy

Legislative policy requires that security and privacy be assessed during the life of an investment. Make sure the system continues to meet all current security and privacy rules and regulations.



CPIC TIP

Remember, security spending must be at least 1% of your ongoing budget.

To obtain information on the current laws, contact the Office's Information Security Officer, OEI's Technical Information Security Staff, or the Agency Privacy Act Officer. Please refer to the following EPA Intranet site for more information on security topics and contacts: <http://intranet.epa.gov/itsecurity/incidents.html#chart>

5.3.3 Finalize Submission Package

EPA allows CPIC submission using the Exhibit 300 of the A-11. Contact OEI for the most recent version.

Review the completed business case and supporting documentation, making sure all of the areas that the QIC and the OMB rate highly are covered. A few extra minutes could be the difference between a funded and retired investment. Investments with insufficient business case documentation will not be included in the IT Investment Portfolio or forwarded to the OMB as part of EPA's IT budget request.

When finished, submit the documentation first to the Budget Office for signatures of its Senior Budget Official, Senior Information Resource Management Official and Senior Resource Official.

Then submit the business case to OEI. Be sure to provide contact information when submitting the business case to OEI.

5.3.4 CPIC Evaluate Phase Review

In this step, OEI will review the business case for accuracy and completeness in:

1. CPIC process steps
2. PIR, if required

3. Whether the project is in trouble – meaning there is a > 10% variance in cost and schedule

First, OEI reviews the business case to ensure that all process steps have been completed. OEI provides any comments and/or questions to the IPT, through the contact information supplied with the submission. That contact person works with the OEI to address the issues and furnish details as requested.

When complete, OEI forwards the updated package to the QIC, who will rely on the IIS to provide a thorough business case review in accordance with Evaluate Phase criteria, determining if it can optimally continue to support mission/user requirements and the Agency's strategic direction. If the investment is troubled, the IIS will evaluate the corrective measures suggested for validity and compliance with Agency risk tolerances. The IIS develops recommendations for the QIC to make a decision on whether to keep this investment as part of the Agency IT Investment Portfolio as is, modify or replace the investment, or retire it.

5.3.5 Evaluate go/no-go decision

During this step, the QIC determines if the investment should continue, be modified or replaced, or retired.

If the project is meeting assumptions and there are no foreseeable issues before the next CPIC submission, the investment continues in the Evaluate Phase.

If the project is troubled, the QIC evaluates the IIS' recommendation and answers the following types of questions to determine if the investment can be modified, replaced, or cancelled.

- Is the IPT representative of all functional areas affected by the investment? Is it fully engaged?
- Is the Project Sponsor engaged? Have there been organizational or environmental changes that will significantly affect investment success and return on investment?
- Does the business need still exist? Is the investment still a viable solution? Have there been material changes in the technology selected?



- Have the performance goals changed materially? Will the solution still deliver expected benefits and help the Agency achieve its strategic goals?
- Are costs accurately estimated? Are there unexpected spikes? Will the benefits of the investment continue to outweigh the costs and is the return on investment within Agency guidelines?
- Is the Risk Inventory complete? Are current risks identified and are the mitigation plans well planned? Are the mitigation plans viable?

If the QIC agrees with the modification, a revised review schedule is established in concert with OEI and the IIS. This formal monitoring of investment progress and the determination of risks and returns will continue throughout the Select Phase.

If the QIC cancels the project, the QIC will determine if the project should be re-designed in SLC Definition. An investment that still has strategic value will most likely go back to

Definition. An investment without strategic value will most likely be retired.

5.3.6 Funding

Funding for the investment should be committed by the Office. If there are any funding issues, raise them with the funding office and Senior Resource Official (SRO). Despite having a funding commitment, the QIC may still decide to retire the investment.

5.4 Exit Criteria

Exiting the Evaluate Phase means one of two things:

1. The investment will be modified and go through the Select Phase again or
2. The investment will be retired.

If the entire investment is to be modified or modernized, the entire business case package will remain as one and will enter the Select Phase.



6 Appendix A - References

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7 Appendix B – Glossary of Terms and Acronyms

Term	Definition
Actual Cost of Work Performed (ACWP)	The costs actually incurred and recorded for work performed within a given time period. An EVM calculation.
Alternatives Analysis	An analysis to compare and evaluate the costs and benefits of various alternatives for meeting a requirement for the purpose of selecting the alternative that is most advantageous to the enterprise.
Baseline	An unchanging estimate, or starting point, for measurement.
Benefit	Quantifiable or non-quantifiable advantage, profit, or gain.
Best Practices	Processes, practices, or systems used by public and private organizations that perform exceptionally well and are widely recognized as improving an organization's performance and efficiency in specific areas. Successfully identifying and applying best practices can reduce business expenses and improve an organization's efficiency.
Budgeted Cost for Work Performed (BCWP)	The sum of the budgets for completed work packages and completed portions of open work packages, plus the applicable portion of the budgets for level of effort and apportioned effort. An EVM calculation.
Budgeted Cost of Work Scheduled (BCWS)	The sum of all WBS element budgets that are planned or scheduled for completion. An EVM calculation.
Business Case	Structured proposal for business improvement that functions as a decision package for organizational decision-makers. A business case includes an analysis of business process performance and associated needs or problems, proposed alternative solutions, assumptions, constraints, and risk-adjusted CBA.
Business Process	A collection of related, structured activities or chain of events that produce a specific service or product for a particular customer or group of customers.
Capital Asset	Tangible property, including durable goods, equipment, buildings, installations, and land.
Capital Planning and Investment Control (CPIC)	A centralized, three-step process by which Agencies will comply with the Clinger-Cohen Act and better manage IT investments. See CCA.
Chief Financial Officer (CFO) Act of 1990	Enhances general management functions of the Office of Management and Budget to improve the efficiency and effectiveness of the Federal Government.
Clinger-Cohen Act (CCA) of 1996	Formerly the IT Management Reform Act, requires that all Agencies use a disciplined CPIC process to acquire, use, maintain and dispose of IT.
Configuration Management	One of five categories of network management defined by the International Standards Organization. As it relates to cyber security services, configuration management is the process of adding, deleting, and modifying connections, addresses, and topologies within a system/network.
Control Phase	The second CPIC phase that requires ongoing monitoring of IT investments against schedules, budgets, and performance measures.



U.S. Environmental Protection Agency

Term	Definition
Cost	Direct and indirect expenses plus any periodic or continuing financial outlays of operations and maintenance.
Cost-Benefit Analysis (CBA)	A technique used to compare the various costs associated with an investment or project with the benefits it proposes to return. CBA should address and account for both tangible and intangible factors.
Cost Post Performance Index (CPI)	Earned value divided by the actual cost incurred for an investment.
Cost Variance (CV)	Earned value minus the actual cost incurred for an investment.
Customer	Groups or individuals who have a business relationship with the organization; those who receive or use, or are directly affected by the products and services of the organization.
Discount Factor (DF)	The factor that translates expected benefits or costs in any given future year into present value terms. The discount factor is equal to $1/(1 + i)^t$ where i is the interest rate and t is the number of years from the initiation date for the program or policy until the given future year.
Discount Rate (DR)	The interest rate used in calculating the present value of expected yearly benefits and costs.
Earned Value	Calculated benefits that the investment creates, to date. Takes into consideration revenue and cost savings.
Earned Value Management	A structured approach to project management and forecasting including comparisons of actual and planned costs, work performed, and schedule.
Effectiveness	An assessment of the qualitative level of achievement of program goals and the intended results, as defined in strategic or other plans or documentation or in legislation. Sometimes characterized as doing the right things.
Efficiency	A measure of the relative amount of resources used in performing a given unit of work. Sometimes characterized as doing things the right way. Can involve unit costing, work measurement (standard time for a task), labor productivity (ratio of outputs to labor inputs), or cycle time.
Enterprise Architecture (EA)	A process for ensuring that an organization's goals and business are supported by information resources
Estimate at Completion (EAC)	The actual costs incurred, plus the estimated costs for completing the remaining work.
Estimate to Complete (ETC)	The cost necessary to complete all tasks from the actual cost of work performed end date through the investment's conclusion.
Evaluate Phase	Capital planning phase that requires IT investments to be reviewed once they are operational to determine whether investments meet expectations. The third CPIC phase.
Exhibit 300	The form on which business cases for major IT investments are submitted to the OMB as part of the budget process. EPA uses this form for the CPIC process.
Federal Enterprise Architecture (FEA) Reference Models	Documents containing best practices as defined by the Federal Government's Program Management Office. The documents are: <ul style="list-style-type: none"> • Technical Reference Model (TRM) • Performance Reference Model (PRM) • Service Component Reference Model (SRM) • Business Reference Model (BRM) • Data Reference Model (DRM) – not yet released



Term	Definition
Financial System	An information system used for any of the following: <ul style="list-style-type: none"> • Collecting, processing, maintaining, transmitting, or reporting data about financial events • Supporting financial planning or budgeting activities • Accumulating and reporting cost information • Supporting the preparation of financial statements
Fiscal Year (FY)	The Federal budget year; spans the dates October 1 – September 30.
Functional Requirements	A description of system capabilities or functions required to execute a required process such as a communication link between several locations or generating specific reports.
General Accounting Office (GAO)	Audits agencies for compliance with CCA. Has published guidance on investment management.
Government Performance and Results Act (GPRA) of 1993	Requires Federal Agencies to establish standards by which to evaluate investments.
Hardware/Equipment	Includes any equipment used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information (e.g., computers and modems); capital and non-capital purchases or leases.
Identifiable Form	Any representation of information that permits the identity of an individual to whom the information applies to be reasonably inferred by either direct or indirect means.
Information Investments Subcommittee (IIS)	Addresses mission priorities and trade-offs for information investment proposals from the perspective of Clinger-Cohen Act requirements, the Systems Modernization Fund, and the Agency’s Information Plan. The Subcommittee is co-chaired by the Deputy CFO and supports the QIC in making recommendations to the Chief Financial Officer and the Chief Information Officer on the appropriateness of information investments.
Information System (IS)	A discrete set of information resources organized for the collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures, whether automated or manual.
Information Technology (IT)	Any equipment or interconnected system or subsystems or equipment used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information.
Information Technology Investment Management (ITIM)	Methodology developed by the GAO that proposed a three-phase process and organizational maturity. Provided the basis for the three-phase CPIC process.
IT Investment	The most appropriate term used by OMB and EPA to reflect any IT system, project, program, or initiative. OMB Circular A-11 differentiates between major IT investments and non-major IT investments. All dollars spent on information technology are considered investments, whether they support an IT system, program, or governance effort of IT investment management processes.
IT Investment Portfolio	All IT investments that EPA funds.
Infrastructure	The IT operating environment (e.g., hardware, software, and communications).



Term	Definition
Integrated Project Team (IPT)	Project team that manages the investment from definition through retirement. Consists of functionally diverse people.
Major IT Investment	An IT project and system that meets criteria established by the OMB, and must follow the EPA CPIC process. A major investment is one that: <ul style="list-style-type: none"> • Requires special management attention because it is important to the Agency's mission; • Was reported as major in the most recent OMB submission and is continuing; • Is for financial management and the investment exceeds \$500,000; • Is directly tied to the top two layers of the FEA; • Is an integral part of the Agency's modernization blueprint; • Has significant program or policy implications; • Has high executive visibility; • Is defined as major by the Agency's CPIC process.
Net Present Value (NPV)	The difference between the discounted present value of benefits and the discounted present value of costs. Also referred to as the discounted net.
Office of Environmental Information (OEI)	The department of EPA who is responsible for the central CPIC process and compliance with OMB requirements.
Office of Management and Budget (OMB)	White House Department responsible for all budgeting and financial management for the Federal Government.
Operational Analysis	From the Capital Programming Guide, it is "[a tracking method of] the system to measure the performance and cost of an operational asset against the baseline established in the Planning Phase. This information will allow agency resource managers to optimize the performance of capital assets. Additionally, operational analysis may indicate the need for the acquisition of a new capital asset. The system established should have the capability to provide simple, easy to understand information that can be used by managers to make sound management decisions." EPA considers the Evaluation Phase of CPIC and an Operational Analysis the same.
Opportunity Costs	Cost of not investing in the initiative or cost of a forgone option.
Paperwork Reduction Act (PRA) of 1995	Minimizes the paperwork burden for citizens by using Federal information to strengthen decision making, accountability, and openness in Government and society, etc.
Payback Period	The number of years it takes for the cumulative dollar value of the benefits to exceed the cumulative costs of an investment.
Performance Gap Analysis	Preliminary research performed to determine the viability of the proposed initiative by performing an alternatives analysis, including market research and extensive interviews with subject matter experts.
Performance Goals	A desired endpoint or purpose of an operation or activity.



Term	Definition
Performance Indicator	<p>Description of:</p> <ul style="list-style-type: none"> • What is to be measured, including the metric to be used (e.g., conformance, efficiency, effectiveness, costs, reaction, or customer satisfaction) • Scale (e.g., dollars, hours, etc.) • Formula to be applied (e.g., percent of “a” compared to “b,” mean time between failures, annual costs of maintenance, etc.) • Conditions under which the measurement will be taken (e.g., taken after system is operational for more than 12 hours, adjusted for constant dollars, etc.)
Performance Management	One of the five categories of network management defined by the International Standards Organization. As it relates to cyber security services, a set of procedures and practices for measuring and recording resource utilization.
Performance Measures	Method used to determine the success of an initiative by assessing the investment contribution to predetermined strategic goals. Measures are quantitative (e.g., staff-hours saved, dollars saved, reduction in errors, etc.) or qualitative (e.g., quality of life, customer satisfaction, etc.).
Post-Implementation Review (PIR)	A review of an investment or project that compares the actual cost, schedule, performance, and other results achieved against the conditions that existed prior to the implementation of the investment. A PIR is conducted after an investment or project has been completed and is fully operational. It can also provide valuable “lessons learned” to be applied to future investments or projects.
Privacy Impact Assessments (PIAs)	A process for examining the risks and ramifications of collecting, maintaining and disseminating information in identifiable form. The PIA is framework for considering the privacy implications of information collected on individuals and where potential disclosure risks may lie.
Project Description	<p>Brief overview of initiative of no more than 100 words to include:</p> <ul style="list-style-type: none"> • Short summary of proposed initiative • Statement of the business functions or processes the initiative supports • Brief summary of benefits resulting from the initiative (tangible or intangible).
Project Plan	A document that describes the technical and management approach to carrying out a defined scope of work, including the project organization, resources, methods, and procedures and the project schedule.
Quality and Information Council (QIC)	Advise and assist the National Program Manager and Chief Information Officer (NPM/CIO) of the Information Office in developing and implementing the Agency’s quality and information goals and policies.
Return	The difference between the value of the benefits and the costs of an investment. In a CBA it is computed by subtracting the Total Discounted Costs from the Total Discounted Benefits, and is also called the Total Discounted Net.
Return on Investment (ROI)	A percentage calculated by dividing the Total Discounted Net by the Total Discounted Costs. To express it as a percentage, multiply by 100. It can also be expressed as (Total Discounted Benefits minus Total Discounted Costs) divided by Total Discounted Costs.



Term	Definition
Risk	A combination of: the probability that a threat will occur, the probability that a threat occurrence will result in an adverse impact, and the severity of the resulting impact.
Risk Adjusted Return on Investment	Adjustment of Return on Investment for the annual cost of risk based on the probability of a risk occurring.
Risk Assessment and Management Plan (Risk Inventory)	A description of potential cost, schedule, and performance risks, and impact of the proposed system to the infrastructure. Includes a sensitivity analysis to articulate the effect different outcomes might have on diminishing or exacerbating risk. Provides an approach to managing all potential risks.
Risk Management	The process concerned with identifying, measuring, controlling, and minimizing risk.
Schedule Variance	Earned value minus the planned budget for the completed work.
Security	Measures and controls that ensure the confidentiality, integrity, availability, and accountability of the information processes and data stored by a computer.
Security Analysis	A formal analysis conducted by the agency security analyst or designee for the purpose of determining the importance of the information, assessing risks, formulating mitigation strategies, and other measures needed to safeguard the system.
Security Plan	Description of system security considerations such as access, physical or architectural modifications, and adherence to Federal and EPA security requirements.
Select Phase	Capital planning phase used to identify all new, ongoing, and operational investments for inclusion into the IT portfolio. The first CPIC phase.
Software	Any software specifically designed to make use of and extend the capabilities of hardware/equipment.
Strategic Management	Ensures that all perspectives, or viewpoints of an organization are represented equally during planning and decision-making.
Subject Matter Expert (SME)	Person who has a lot of knowledge on one subject and who can provide requirements or test the functionality of the system.
Sunk Cost	A cost incurred in the past that will not be affected by any present or future decisions. Sunk costs should be ignored in determining whether a new investment is worthwhile.
System Life Cycle (SLC)	The duration of the system life organized into five phases: definition, acquisition or development, implementation, operation and maintenance, and termination.
Tactical Management	The day-to-day monitoring of strategic objectives.
User Requirements	The technical requirements for hardware, software, facilities, personnel, procedures, technical data, personnel training, spares, repair parts, and consumables needed to test, deploy, operate, and maintain a system, network, investment, or project. Also called Customer or Stakeholder Requirements.
Variance at Completion (VAC)	The difference between the total budget assigned to a contract, WBS element, organizational entity, or cost account and the estimate at completion; represents the amount of expected overrun or under run.



8 Appendix C – Quality and Information Council Charter

This Appendix contains parts of the QIC, released in 1999 that relate to the CPIC process. It was prepared by the Office of Information Transition & Organizational Planning and is provided in this document to show how business cases are examined and evaluated by the QIC.

Note: Some of the content in this section is still in the process of being updated. Updated information will be included in subsequent versions.

8.1 Purpose, Authority and Duration

(1-1) This document charters EPA's QIC. The purpose of the QIC is to advise and assist the National Program Manager and Chief Information Officer (NPM/CIO) of the Information Office in developing and implementing the Agency's quality and information goals and policies. The Council provides an efficient mechanism through which senior Agency officials can raise and debate strategic information issues facing the Agency. It offers the NPM direct access to those officials to obtain their counsel on, and commitment to, quality and information strategies and policies.

(1-2) On matters internal to his or her program, including budget preparation, the NPM/CIO has the authority to make decisions unilaterally or in consultation with the QIC, as he/she considers appropriate. On strategic directions, major investment decisions, and significant policy issues that affect the Agency at large or the operations of multiple EPA programs, the NPM will inform and consult with the QIC prior to reaching a decision. In determining the authority of the NPM vs. the role of the QIC, in general, the QIC will provide focus on "what" the Agency's information direction, needs, or priorities should be; while the NPM/CIO authority will focus on "how" those directions, needs, or priorities are carried out.

(1-3) The Quality and Information Council is considered a permanent EPA body. Its charter can be amended by a two third's vote of the Council membership or in response to direction from the Administrator or Deputy Administrator. This charter shall be periodically reviewed and updated as necessary, as outlined in Section (5-15).

8.2 Scope and Functions

8.2.1 Policy, Planning and Innovation.

(2-1) Removed⁵

(2-2) The QIC will function as a forum in which ideas and issues from the NPM and other QIC members can be raised and vetted. It will provide an opportunity for cross-office exchange and development of ideas on quality and information. It is intended to stimulate the creation of internal partnerships on information strategies, initiatives and opportunities for efficiency. It should encourage forward-looking discussions of current and emerging issues.

(2-3) Removed

8.2.2 Investment Review.

(2-4) By working with the NPM/CIO, the QIC will develop criteria for information investment decisions. Information investments include resources that affect programs and regions, including review of business case analyses to support investment and return-on-investment, the Systems Modernization Fund, major data acquisitions, and systems development activities. It may eventually include major Agency investments in such information activities as monitoring and modeling.

⁵ Indicates that this section, and others in the original QIC Charter were removed or deleted after initial publication.



(2-5) The QIC will review strategic and priority information investments for consistency with Agency criteria and the Agency's Information Plan. It will assess the fit between individual office proposals and the multi-year plan. The QIC will work through the Information Investments Subcommittee (IIS) to accomplish this (see sections (3-1) and (3-3)).

(2-6) On the advice of the QIC, the NPM/CIO will recommend proposals to the Chief Financial Officer for investment consideration during the Agency's budget formulation process.

(2-7) The QIC will establish a relationship with the Working Capital Fund Board sufficient enough to assure consistency between actions taken by the two groups.

8.2.3 Relationship Between the QIC and the WCF Board

(as revised from Section III-E of the Charter for the Working Capital Fund Board)

(E) Quality Information Council/WCF Board Relationship:

EPA's Quality Information Council and the WCF Board coordinate their separate decision making responsibilities related to the provision of IT services in the following areas:

- QIC inclusion of specific criteria to assess impact on WCF service offerings in making funding decisions to implement information strategic initiatives;
- WCF Board inclusion of specific criteria to assess impact on the QIC's investments in making funding decisions on WCF services and rates;
- WCF Board consideration of the services which implement the QIC's strategies as potential WCF services;
- WCF Board consideration of information capital acquisitions for new architecture, as supported by the QIC's concurrence on consistency with the Agency's strategic direction for information; and
- The QIC's consideration of major information investments recommended by the WCF Board for inclusion in the Agency's information investment process.

Support staff to the QIC and the WCF Board will also coordinate by attending the meetings of both committees/boards. In addition, the staffs will exchange meeting materials, minutes, decision papers, and business case analyses and other justifications supporting capital investments, with the goal of keeping both groups informed on issues affecting each other and appropriately involved in the decision-making process. Notwithstanding the above coordination commitments, the QIC and WCF Board both retain full authority to make final recommendations to the CIO/CFO within their areas of responsibilities outlined in their respective charters.

8.2.4 Management and Oversight.

(2-8) The QIC will act to improve consistency in implementation of Agency quality and information policies. It will serve as a review mechanism to ensure that a program office's or region's information projects are consistent with established Agency quality and information policies or standards. Council members will ensure implementation of Agency-wide policies, as partners with the NPM/CIO in furthering the quality and information agenda of the Agency.

(2-9) Removed

8.3 Subcommittees

(3-1) The QIC will establish 4 permanent subcommittees to address information issues facing the Agency. These are:

1. Quality Subcommittee
2. Information Investments Subcommittee
3. Information Technology Subcommittee
4. Collection and Access Policy Subcommittee

At its discretion, the QIC may create short term or *ad hoc* groups as either subcommittees or work groups within subcommittees.

(3-2) Removed

(3-3) The Information Investments Subcommittee will address mission priorities and trade-offs for information investment proposals from the perspective of Clinger-Cohen Act requirements, the Systems Modernization Fund,



and the Agency's Information Plan. The Subcommittee will be co-chaired by the Deputy CFO and will support the QIC in making recommendations to the Chief Financial Officer and the Chief Information Officer on the appropriateness of information investments.

(3-4) The IT Subcommittee will address executive-level issues regarding the Agency's IT infrastructure including customer and mission needs that require technical solution, long-term technology planning, and systems integration.

(3-5) Removed

(3-6) Removed

(3-7) Removed

(3-8) Upon chartering of the QIC, panels operating under the EMMC and their associated workgroups will be discontinued. The functions of these panels will be assigned to the QIC and the OEI or to ORD. As necessary to address the issues considered by these panels, the OEI or ORD may reconstitute or restructure panels or work groups. The QIC and the OEI will assume responsibility for Agency policy on environmental monitoring, such as Performance Based Measurement Systems (PBMS), cross-agency efforts to improve the consistency and quality of Agency methods, and developing an agency-wide monitoring strategy. The ORD will be responsible for Agency policy on the accreditation of laboratories and for implementation of PBMS.

(3-9) Subcommittees will be chaired by the QIC's members, and will be composed of the QIC or senior Agency officials with a perspective on the issues under the Subcommittee's purview. They will be co-chaired by a QIC member and by an SES executive in the Information Office, as appropriate to respond to governing legal and regulatory requirements.

(3-10) Removed

(3-11) As necessary, Subcommittee Chairs will be empowered to select staff for workgroups to develop proposals and options for Subcommittee or Council consideration.

(a) Workgroup members will be designated by the Subcommittee Chair with advice from affected programs and regions.

(b) Workgroups will be given a specific charge and lifespan. In general, workgroups should not continue beyond their stipulated lifespan.

(3-12) Removed

8.4 Relationship with the States

Removed

8.5 Administrative Requirements

Removed

8.6 Support Staff

Removed.



9 Appendix D – Performance Measurement

9.1 Purpose

Performance measurement is the process whereby an organization establishes the parameters within which programs, investments, and acquisitions reach the desired results in support of mission goals.

Performance measures are set during the Select Phase and are assessed during Control and Evaluate phases. The focus of performance measurement is on outcomes rather than outputs, or, how well the IT investment enables the program or agency to accomplish its primary mission and close performance gaps. Performance measurement should not only address operational performance measures of input, activities, and output, but also track resources and activities of the surrounding processes integrated with the investment.

CPIC TIP

Performance is evaluated using two criteria - effectiveness and efficiency. Effectiveness demonstrates that an organization is doing the right things, while efficiency demonstrates that an organization is doing things the right way.

Performance measure data can be time-consuming and costly to collect; therefore it is very important to ensure their effectiveness. When developing performance measures, make sure they are:

- Strategically relevant. Factors should matter and make a difference, promote continuous and perpetual improvement, focus on the customer and are agreed to by stakeholders;
- Short, clear, and understandable;

- Measurable and meaningful, appropriate to the organizational level; and
- Linked to activity and provide a clear relationship between cause and effect, focus on managing resources and inputs, and can be discarded when utility is lost or when new, more relevant measures are developed.

9.2 Process

Performance measures are developed through a series of steps. It is important to understand that developing measures is only one part of the more comprehensive process. After measures are developed, baseline information is gathered, (if it does not already exist), and performance information is collected, analyzed, and interpreted.

The following five steps are completed during the different phases of the CPIC process. Steps one and two are completed during the Select Phase. Step three can be completed during the Control phase as a milestone in the project plan. Steps four and five are completed during the Evaluate Phase.

1. Analyze how the investment supports the mission goals and objectives and reduces performance gaps
2. Develop IT performance objectives and measures that characterize success
3. Develop collection plan
4. Collect data and evaluate, interpret, and report results
5. Review process to ensure it is relevant and useful

9.2.1 Analyze How the Investment Supports the Mission and Reduces Performance Gaps

Effective, outcome-based performance measures are derived from the relationship



between the new investment and how users will apply its outputs. The linkage between users' requirements and proposed investments, or those that are already part of the Agency IT Investment portfolio, is the key activity in this step.

This concept is often described as a method of strategically aligning programs and support functions with the agency's mission and strategic priorities. The first step is to identify the organization's performance gap, the critical tasks necessary to close the gap, and the strategies that will be implemented to complete those tasks. Begin with the mission analysis conducted as part of the investment's justification for a head start on this step. Make sure the mission analysis addresses the following questions:

- What will the system do? What are its major functions or feature? What is the purpose of that system? How is it used?
- Is this system a stand-alone system or is it used or integrated with another large system?
- What aspects of the system, service, and information quality are needed for the system to perform optimally or acceptably?
- Identify who will use the system. What is the principal business task they perform? How will using the system help them with that task?
- How does completion of that task contribute to a business function?
- How does completion of the business function contribute to achievement of the program goals?
- How does completion of program goals contribute to organizational goals and Agency goals?

Determine whether there are related IT investments that impact the mission area and goals selected. Understand the relationships between various IT investments that address the same or similar needs to help identify potential areas for consolidation.

Once the mission is clearly defined, perform a gap analysis to understand how it can improve mission performance. The analysis begins with the premise that it will improve effectiveness,

efficiency, or both. To accomplish this, define requirements and answer following questions:

- Why is this application needed?
- How will the added functionality help users accomplish the mission?
- How will the added functionality improve day-to-day operations and resource use?

Work with users to develop a baseline measurement of the current as-is state for comparison to the to-be state so gaps can be calculated. For example, the investment is successful when the gap is reduced by "x" amount.

9.2.2 Develop IT Performance Measures that Characterize Success

Well-designed performance measures define success criteria for the investment. The following questions will help to qualify each measure:

- Is it useful for monitoring progress and evaluating the degree of success?
- Is it focused on outcomes that stakeholders will clearly understand and appreciate?
- Is it practical? Does it help build a reliable baseline and cost-effectively collect performance data at periodic intervals?
- Can the performance measure be used to determine the level of investment risk and whether the investment will meet performance targets?

A positive response to each question ensures that the performance measure will effectively and efficiently measure the IT investment. Additionally, this process will help to limit the number of performance measures so management attention is focused on those that have the greatest priority or impact.

Change criteria if it is too difficult to measure. Or, if the measure has indirect rather than direct outcomes, use "surrogate" performance measures that mirror actual outcomes. For example, it is difficult to measure the direct benefit of computer-based training (CBT) systems, but a surrogate measure might be the



percentage of staff achieving certifications through the CBT, which is easy to count.

Of the possible measures, select one or more to report performance against each performance gap. Keep in mind that one measure may provide information for more than one gap. The objective is to select the fewest number of measures that will provide adequate and complete information about progress.

Selecting the fewest performance measures is important because data collection and analysis can be costly. When selecting performance measures, ensure that the benefit of information received is greater than the costs, and that data collection does not hinder accomplishment of primary missions.

Costs are determined by calculating the amount of dollars and staff effort required to collect, store, and analyze data. When calculating costs, consider whether they are largely confined to initial or up-front costs, or will occur throughout the IT lifecycle. For example, the cost of developing and populating a database may have a large initial cost but will diminish significantly over time.

Answer the following questions to help determine the cost of tracking a specific performance indicator:

- What data are required to calculate the performance measure?
- Who collects the data and when? How will it be stored and reported?
- What is the verification and validation strategy for the data collection?
- What is the method to ensure the quality of the information reported?

In addition to determining costs, it is also necessary to determine the baseline performance, target performance, and expected time to reach the target. The baseline value is the starting point. If performance measures are currently in use, historical data will provide the baseline. Otherwise determine the baseline by using reasonable analysis methods such as:

- Benchmarks from other agencies and private organizations
- Initial requirements

- Internal historical data from existing systems
- Imposed standards and requirements

To determine the target value, obtain stakeholder requirements for the new system. Targets may be graduated over time, especially for IT investments that are being installed or upgraded or as environmental factors change. Consider how much time it will take to reach the goal when determining performance success. For example, if the target is reached two years after originally planned, the investment's ROI will be lower than originally calculated, and the investment may be a financial failure.

9.2.3 Develop Collection Plan

To ensure performance data is collected in a consistent, efficient, and effective manner, it is useful to develop and publish a collection plan so all participants know their responsibilities and can see their contributions. The collection plan details the following items:

- Activities to be performed
- Resources to be consumed
- Target completion and report presentation dates
- Decision authorities
- Individuals and responsibilities for data collection

The collection plan answers the following questions for each performance measure:

- How is the measurement taken?
- What constraints apply?
- Who will measure the performance?
- When and how often are the measurements taken?
- Where are the results sent and stored, and who maintains results?
- What is the cost of data collection?

While costs should have been considered during the previous step, the actual cost will be more evident at this stage. Excessively costly performance measures should be replaced by less costly ones, without sacrificing results. Consider revisiting the collection plan to determine less costly procedures. For example, a sampling may produce accurate results at



significantly less cost than counting every occurrence.

To ensure data is being collected in a cost-effective and efficient manner, it is involve the team when developing performance measures. The collectors will do a much better job if they believe the performance measures are valid and useful, and they will have insight regarding the best way to collect the data.

9.2.4 Evaluate, Interpret, and Report Results

To evaluate performance, compile data, and report it according to the collection plan that was constructed in the previous step. Use the following questions when evaluating the data:

- Did the investment exceed or fall short of expectations? By how much and why?
- What were the unexpected benefits or negative impacts to the mission?
- What adjustments can and should be made to the measures, data, or baseline?
- What actions or changes would improve performance?

This evaluation reveals any needed adjustments to the IT investment or performance measures. It also helps surface any lessons learned that could be fed back to the CPIC process.

9.2.5 Review to Ensure Relevance and Usefulness

To ensure that performance measures are still relevant and useful, answer the following questions:

- Are the measures still valid?
 - Have higher-level mission or IT investment goals, objectives, and critical success factors changed?
 - Are threshold and target levels appropriate in light of recent performance and changes in technology and requirements?
 - Can success be defined by these performance measures?
 - Can improvements in mission or operations efficiency be defined by the measures?

- Have more relevant measures been discovered?
- Are the measures addressing the right things?
 - Are improvements in performance of mission, goals, and objectives addressed?
 - Are all objectives covered by at least one measure?
 - Do the measures address value-added contributions made by overall investment in IT and/or individual programs or applications?
 - Do the measures capture non-IT benefits and customer requirements?
 - Are costs, benefits, savings, risks, or ROI addressed?
 - Do the measures emphasize the critical aspects of the Agency?
- Are the measures the right ones to use?
 - Are measures targeted to a clear outcome (results rather than inputs or outputs)?
 - Are measures linked to a specific and critical organizational process?
 - Are measures understood at all levels that must evaluate and use them?
 - Do the measures support effective management decisions and communicate achievements to internal and external stakeholders?
 - Are measures consistent with individual motivations?
 - Are measures accurate, reliable, valid, and verifiable?
 - Are measures built on available data at reasonable costs and in an appropriate and timely manner for the purpose?
 - Are measures able to show interim progress?
- Are measures used in the right way?
 - Are measures used in strategic planning (e.g., to identify baselines, gaps, goals, and strategic priorities) or to guide prioritization of program initiatives?



- Are measures used in resource allocation decisions and task, cost, and personnel management?
- Are measures used to communicate results to stakeholders?

10 Appendix E – Cost Benefit Analysis and Alternative Selection

10.1 Purpose

Current laws and regulations require agencies to conduct a CBA prior to deciding whether to initiate, continue, or implement an IT investment. The level of detail required varies and should be commensurate with the size, complexity, and cost of the proposed investment.

The CBA supports decision-making and helps ensure resources are effectively allocated to support mission requirements. The CBA is listed under the Alternatives Analysis section of the Exhibit 300, and should demonstrate that at least three alternatives were considered and the chosen alternative is the most cost-effective in the context of budgetary and political considerations.

To select viable alternatives, refer to the FEA to identify potential alternatives for partnering or joint solutions. Other possible alternatives include:

- In-house development versus contractor development;
- In-house operation versus contractor operation;
- Current operational procedures versus new operational procedures; or
- One technical approach versus another technical approach.

The CBA should include comprehensive estimates of the projected benefits and costs for each alternative. General rules are that costs associated with both tangible and intangible benefits should be included. Try to assign numeric costs to intangible benefits so they can be included in the calculations. Sunk costs (costs incurred prior to the project start date) and realized benefits (benefits incurred prior to the project start date) should not be considered.

At the end of the analysis, the alternative that provides the greatest net benefit to the agency should be selected.

10.2 Process

The most thorough way to estimate costs is to break down each alternative into its simplest parts and link the parts together. Not only does this ensure that all parts were planned for, but it provides linkages back to customer requirements.

This section of the document will provide sample tables to use in the CBA, and provides step-by-step guidance though this very detailed and time-consuming process.

The CBA process can be broken down into the following steps:

1. Determine/define objectives
2. Document solution requirements
3. Choose at least three alternatives
4. Collect cost data
5. Estimate costs for each alternative
6. Estimate benefits for each alternative
7. Document assumptions
8. Adjust costs for risk
9. Calculate Return on Investment for each alternative
10. Evaluate alternatives and select solution

Each of these steps is detailed in the following sections. By far, the best way to collect and maintain cost data is by using a spreadsheet program. A lot of related tables will be created during this exercise, so linking the tables together via the spreadsheet will make analysis faster and more accurate.



10.2.1 Determine/Define Objectives

Start with the Justification section of the CPIC documentation (Exhibit 300), and include background information such as staffing, system history, and customer satisfaction data when defining the objectives.

10.2.2 Document Solution Requirements

The system requirements is the first table in the cost-benefit analysis. Use the requirements that were identified during the Definition phase of the System Life Cycle. For the as-is alternative, requirements will default to the current state, which will function as a baseline for the other alternatives.

If customer or user requirements weren't identified during SLC Definition, estimate what the requirements are using broad categories such as:

- Functional capabilities – what functions will the customers/users require to gain access to the system and data, and how will they interface with the system? What functions will any integrated systems require?
- System performance – what are the processing requirements for successfully delivering the functional capabilities?
- System capacity – what is the storage requirement for this system? What type of data will be stored? Also include security requirements.
- System reliability – what is the allowable downtime? Can the system go down every night for backup, or is it required to be available 24x7? The higher the reliability requirements, the higher the cost, so plan this carefully.

After determining the requirements, begin the table by listing the requirements down the side as the row headings and the system

components across the top as the column headings. Do this for each alternative, using the table below is an example. The following list is a sample of system components:

- Software
 - Manufacturer
 - Name
 - Version number
 - Year acquired
 - License term
 - Hardware requirements
 - Annual maintenance
- Hardware
 - Manufacturer
 - Make/Model/Year
 - Cost
 - Power requirements
 - Expected life
 - Maintenance requirements
 - Operating characteristics (e.g., size, speed, capacity, etc.)
 - Operating systems supported
- Peripherals
 - Printers
 - Scanners
 - External storage drives
 - PDAs
- Physical Facilities
 - Location
 - Size
 - Capacity
 - Structure type
 - Availability



Table 10.1 - Map of User Requirements to System Components

Requirement/System Component	Software	Hardware	Peripherals	Physical Facilities
Functional Capabilities				
1. <i>Contains workflow module</i>	XYZ Content Management Solution workflow add-in. 25 user licenses.			
2. <i>Contains Imaging capabilities</i>	ABC Imaging add-in. 25 user licenses.	5 Dedicated workstations for scanning documents. - Personal Computers - LAN connections	5 ABC Scanners	One at each identified EPA location in X region.
System Performance				
1. <i>Image and index 60 documents per minute</i>	XYZ Content Management Solution. 25 user licenses			
2. <i>Full text search and retrieval within 15 seconds of mouse click</i>	Popular DBMS. 5 developer licenses.			
System Capacity				
1. <i>Secure, onsite storage</i>	Popular DBMS. 5 developer licenses.	5 Servers		One at each identified EPA location in X region.
2. <i>Storage growth rate of 5 TB per year</i>		5 Disk Jukeboxes		
System Reliability				
1. <i>Access 7am – 12pm EST</i>	Popular DBMS will accommodate.			
2. <i>30 day backup schedule, 30th day saved for 12 months.</i>	Popular DBMS will accommodate backup scripts.		42 tapes of G manufacture.	5 fireproof vaults for tape storage at each EPA location in X region.

10.2.3 Choose at Least Three Alternatives

EPA follows OMB’s guidelines and requires three alternatives for business case analysis, with one alternative being as-is, to continue with no change. Each viable technical approach should be included as an alternative. When selecting the alternatives, be sure to plan the investment’s lifecycle, which is when the system will either be retired or replaced with upgraded technology. If the alternatives have different lifecycles, be sure to explain the reasons why.

10.2.4 Collect Cost Data

To calculate how much it will cost to design, develop and run each of the alternatives, collect data from various sources. Do this for all three Alternatives. EPA recommends that the following cost elements are included in the business cases. Examples of cost elements are:

- Hardware, whether leased or purchased:
 - Supercomputers, mainframes, minicomputers, microcomputers, disk drives, tape drives, printers, telecommunications, voice and data networks, terminals, modems, data encryption devices, and facsimile equipment.
- Software, whether leased or purchased:
 - Operating systems, utility programs, diagnostic programs, application programs, and commercial-off-the-shelf (COTS) software.
- Development Costs, whether developed by employees or consultants:
 - Personnel costs including compensation and benefits.
 - Opportunity costs



- Program Costs are related costs for the entire program, including personnel to run the system and related processes.
- Operations and Maintenance are ongoing hardware and software costs after initial purchases.
 - Hardware upgrades and software licensing and software patches.
 - Upgrades and consulting.
 - Training fees associated with upgrades.

To find cost information, start with the data sources listed below:

- **Historical Organization Data**—If contracts were used to provide system support in the past, they can provide the estimated future cost of leasing and purchasing hardware and hourly rates for contractor personnel. Contracts for other system support services provide comparable cost data for the development and operation of a new system.
- **Current System Costs**—Current system costs can be used to price similar alternatives.
- **Market Research**—Quotes from multiple sources, such as vendors, Gartner Group, IDC Government, and government-wide agency contracts (GWACS), can provide an average, realistic price.
- **Publications**—Trade journals usually conduct annual surveys that provide general cost data for IT personnel. Government cost sources include the General Services Administration (GSA) pricing schedule and the OMB Circular A-76, “Performance of Commercial Activities” supplemental listing of inflation and tax rates.
- **Analyst Judgment**—If data is not available to provide an adequate cost estimate, the

CBA team members can use judgment and experience to estimate costs. To provide a check against the estimates, discuss estimated costs with other IT professionals or the IPT’s budget analyst.

- **Special Studies**—Special studies can be conducted to collect cost data for large IT investments. For example, the Federal Aviation Administration (FAA) used three different in-house studies to provide costs for software conversion, internal operations, and potential benefits. These data sources became the foundation for their CBA.
- **Personnel Costs**—Personnel costs are based on the guidance in OMB Circular A-76, “Supplemental Handbook, PART II—Preparing the Cost Comparison Estimates.” Government personnel costs include current salary by location and grade, fringe benefit factors, indirect or overhead costs, and General and Administrative costs.
- **Depreciation**—The cost of each tangible capital asset should be spread over the asset’s useful life (i.e., the number of years it will function as designed). OMB prefers that straight-line depreciation be used for capital assets.

10.2.5 Estimate Costs for Each Alternative

Create the cost table by transferring the system components from the column headings in Table 10.1 table created in 10.2.2 to the row headings in Table 10.2, shown below. The cost elements described above become the column headings, as shown below. Fill in the costs for each intersection. The result is a cost that can be tracked back to each requirement. If the investment becomes too costly, requirements can be analyzed and eliminated, with the associated costs accurately tracked through.



Table 10.2 – Cost of each System Component by Cost Element

System Component/Cost Element	Hardware Leased or Purchased	Software Leased or Purchased	Development Costs	Program Costs	Operations and Maintenance
<i>XYZ Content Management Solution workflow add-in. 25 user licenses.</i>	N/A	\$50,000 upfront licensing fee	XYZ consulting to set up initial workflows and train 5 superusers at each location = \$10,000	Sunk cost – not included.	\$25,000 annual maintenance fee for 25 licenses.
<i>ABC Imaging add-in. 25 user licenses.</i>	N/A	\$50,000 upfront licensing fee	Train 5 imaging personnel included in \$10,000 above.	5 incremental HC as imaging specialists, one at each location. \$500,000 annually.	\$25,000 annual maintenance fee for 25 licenses.
<i>5 Dedicated workstations for scanning documents. - Personal Computers - LAN connections</i>	PCs = \$25,000 LAN drops = \$500	Operating systems included in H/W cost.	N/A	50 Additional support hours = \$5,000 annually.	PC upgrades \$25,000 every 5 years.
<i>5 ABC Scanners</i>	\$3,000 each = \$15,000 (includes first year support)	Included in H/W cost.	N/A	Included in line above.	Support contracts with ABC beginning year 2 = \$5,000 annually.
System Component/Cost Element	Hardware Leased or Purchased	Software Leased or Purchased	Development Costs	Program Costs	Operations and Maintenance
<i>Popular DBMS. 5 developer licenses.</i>	N/A	100,000 5 server licenses, 5 developer licenses	Sunk cost – utilize on-staff DBAs.	Sunk cost – utilize on-staff DBAs.	Annual server and developer licenses = \$15,000 annually
<i>5 Servers</i>	\$50,000 for all.	N/A	N/A	N/A	Service contract with Popular, \$10,000 annually
<i>5 Disk Jukeboxes</i>	\$150,000	Included in cost of H/W	Consulting fees for setup and DBA training = \$10,000	N/A	Service contract = \$10,000 annually
<i>42 tapes of G manufacture for each location</i>	\$10,500	N/A	N/A	5 tapes a year = \$250	N/A
<i>- 5 fireproof vaults for tape storage at each EPA location in X region.</i>	\$5,000	N/A	N/A	N/A	N/A



U.S. Environmental Protection Agency

Perform a quick summary of the dollars spent in each fiscal year by system component, as shown in Table 10.3. The **Total** column is what will be reported on the Exhibit 300 for this Alternative.⁶

Goes into Alternative table in Exhibit 300.

Table 10.3 – Dollars Spent for each Cost Element by Year

Cost Element /Year	Fiscal Year 1	Fiscal Year 2	Fiscal Year 3	Fiscal Year 4	Fiscal Year 5	Total
Hardware	256,000	0	0	0	0	256,000
Software	200,000	0	0	0	0	200,000
Development	30,000	0	0	0	0	30,000
Program		505,250	505,250	505,250	505,250	2,021,000
O&M	0	90,000	90,000	90,000	115,000	385,000
Total	486,000	595,250	595,250	595,250	620,250	2,892,000

Additionally, the OMB requires a Summary of Spending for Investment Stages. To help with that reporting, summarize the data again by lifecycle phase. All three different lifecycle phase names are listed below.

Table 10.4 – Dollars Spent for each Cost Element by Life Cycle Phase⁷

CPIC Phase	Select	Control		Evaluate		
Project Stage	Planning	Acquisition		Steady – State		
EPA SLC Phase	Definition	Development	Implementation	Operations and Maintenance	Termination	Total
Hardware	0	256,000			0	
Software	0	200,000			0	
Development	0		30,000		0	
Program	0			2,021,000	0	
O&M	0			385,000	0	
Total	0	456,000	30,000	2,406,000	0	2,892,000

At this point, the cost for each phase can be:

1. Traced back to original system requirements;
2. Summarized into the CPIC phases for the Exhibit 300; and
3. Included in the investment’s SLC documentation.

⁶ Hardware = 25,000 + 500 + 15,000 + 50,000 + 150,000 + 10,500 + 5,000 = 256,000

Software = 50,000 + 50,000 + 100,000 = 200,000

Development = 10,000 + 10,000 + 10,000 = 30,000

Program = 500,000 + 5,000 + 250 = 505,250

O&M = 25,000 + 25,000 + 5,000 + 15,000 + 10,000 + 10,000 = 90,000 plus year 5 add an additional 25,000 = 115,000

⁷ CPIC Select = OMB Planning = SLC Definition;

CPIC Control = OMB Acquisition = SLC Development and Implementation;

CPIC Evaluation = OMB Steady – State = SLC Operations and Maintenance, and Termination.



10.2.6 Estimate Benefits for Each Alternative

Complete the following activities to identify and estimate the value of benefits:

Define Benefits—Benefits are the services, capabilities, and qualities of each alternative. They're also known as the return from an investment or realized savings. The following questions will help define benefits for IT systems and enable alternative comparisons:

- *Accuracy*—Will the system improve accuracy by reducing data entry errors?
- *Availability*—How long will it take to develop and implement the system?
- *Compatibility*—How compatible is the proposed alternative with existing procedures?
- *Efficiency*—Will one alternative provide faster or more accurate processing?
- *Maintainability*—Will one alternative have lower maintenance costs?
- *Modularity*—Will one alternative have more modular software components?
- *Privacy*—Does one alternative provide better safeguards for protecting the data collected, disseminated, or maintained within the investment?
- *Reliability*—Does one alternative provide greater hardware or software reliability?
- *Security*—Does one alternative provide better security to prevent fraud, waste, or abuse?

Identify Benefits—Every proposed IT system should have identifiable benefits for both the organization and its customers. Organizational benefits include flexibility, organizational strategy, risk management and control, organizational changes, and staffing impacts.

Customer benefits include improvements to the current IT services and the addition of new services. Have the collaborating stakeholders on the IPT will help to identify and determine how to measure and evaluate the benefits.

Establish Measurement Criteria—Establishing measurement criteria for benefits is crucial because the GPRA and the Clinger-Cohen Act (CCA) emphasize tangible benefits related to the organization's overall mission and goals. See **Appendix D—Performance Measurement** for guidance on how to develop performance measures.

Classify Benefits—Benefits that are “capable of being appraised at an actual or approximate value” are called tangible benefits. Benefits that cannot be assigned a dollar value are called intangible benefits.

Estimate Tangible Benefits—Estimate the dollar value of benefits by determining their fair market value. Market value is the price that a private sector organization would pay to purchase a product or service. Use the sources listed in 10.2.4 as sources of this data.

Quantify Intangible Benefits—Quantify intangible benefits by identifying hidden or related data that can be quantified. For example, an increase in morale is an intangible benefit that is hard to measure. But a reduction in the number of missed workdays, or a reduction in employee turnover can be measured.

Create a table similar to Table 10.3, with the list of benefits as row headers and the Fiscal Years as column headers. Calculate the total benefits per year. Unless the investment has an immediate positive impact on the Agency, don't expect to see any benefits until after the investment is fully implemented.

10.2.7 Document Assumptions

It is important to document all assumptions and, if possible, justify them on the basis of prior experiences or actual data. Use this as an opportunity to explain why some alternatives are not included. If an alternative is eliminated because it is not feasible, the assumption should be clearly explained and justified.

10.2.8 Adjust Costs for Risk

The OMB requires that the risk adjusted return on investment is compared for each alternative



in order to determine which one is the best solution.

Risk can be quantified into a dollar amount, or “Risk Adjustment.” To quantify the risk adjustment, follow the steps below:

1. Conduct a risk analysis by conducting a review as described in **Appendix F – Risk Assessment**.
2. Estimate the probability that the risk will occur.

3. Estimate the cost to the Agency if the risk occurs.
4. Calculate the cost of risk for the investment by multiplying the cost by the probability percentage. Add the totals for each risk area.
5. Divide the total by the number of risks.
6. Add the amount in #5 to each annual cost. In the table below, \$48,267 is the Risk Adjustment.

Table 10.5 - Annual Risk Adjustment

Risk Area	Probability of Occurring	Cost if Occurs	Total
Technical	4.0%	\$1,100,000	\$44,000
Strategic	22.0%	\$90,000	\$19,800
Security	9.0%	\$900,000	\$81,000
Total Probable Cost			\$144,800
Divided by No. Risk Areas			3
Total Annual Risk Adjustment			\$48,267

10.2.9 Calculate Return on Investment for Each Alternative

After costs and benefits for each alternative have been identified and calculated for each fiscal year, they need to be adjusted for risk and converted to present value dollars so they can be fairly compared.

For example, one alternative has a 5-year investment and a second has a 10-year investment. The 5-year investment will return a net benefit of 5 million dollars and the 10-year investment will return a net benefit of 7 million dollars.

At first glance, it looks like the 10-year investment is the better choice, as the return is 2 million dollars greater than the first. However, dollars weaken as time goes on, meaning that a dollar gained in year 10 is worth less than a dollar gained in year 5.

In other words, 5 million dollars gained over 5 years are worth more than 7 million dollars gained over 10 years.

Present values are calculated by multiplying the future value times the discount factors published in the OMB Circular A-94. Contact OEI for the correct DRs to use as they change annually.

Using a table in a spreadsheet program, list the years down the side as row headers. The column headers will be the following, in this order. See Table 10.6 as an example.

1. Annual Cost (AC)
2. Risk Adjusted Annual Cost (RAAC)
3. Annual Benefit (AB)
4. Discount Rate (DR)
5. Discounted Cost (DC)
6. Discounted Benefit (DB)
7. Net Present Value. (NPV)

Drop the Yearly Totals from Table 10.3 and the related benefits table that was created in step 10.2.6 and calculate:

1. $DC = RAAC \times DR$
2. $DB = AB \times DR$
3. $NPV = DB - DC$



Table 10.6 - Net Present Value for Alternative 2

Year	Annual Cost (AC)	Risk Adjusted Annual Cost (RAAC)	Annual Benefit (AB)	Discount Rate (DR)	Discounted Cost (DC) RAACxDF	Discounted Benefit (DB) ABxDF	Net Present Value (NPV) DB - DC
1	486,000	534,267	0	0.9667	516,476		-516,476
2	595,250	643,517	700,000	0.9035	581,418	632,450	51,032
3	595,250	643,517	1,000,000	0.8444	543,386	844,400	301,014
4	595,250	643,517	1,000,000	0.7891	507,799	789,100	281,301
5	620,750	669,017	1,000,000	0.7375	493,400	737,500	244,100
Total	2,892,500	3,133,835	3,700,000		2,642,479	3,003,450	360,971

Sum each row in the NPV column to calculate the total NPV. Do this for each Alternative. The Net Present Value is \$360,971, meaning that future benefits outweigh future costs by \$360,971.

Return on Investment (ROI) is used as a quick way to see by what percent the benefits outweigh the costs. In Table 10.7, for Alternative 1, the benefits outweigh costs by 50%. For Alternative 2, the benefits outweigh costs by 14%.

Table 10.7 - Return on Investment for each Alternative

Alternative	Discounted Cost (DC)	Discounted Benefit (DB)	Net Present Value (DB-DC)	Return on Investment (DB/DC)
1	500,000	750,000	250,000	1.50
2	2,642,479	3,003,450	360,971	1.14
3	1,900,000	2,000,000	100,000	1.05

In addition to evaluating the alternatives based on ROI, payback period should be taken into consideration. The payback period is the point of time when the investment crosses from being in the 'red' to being in the 'black'. Using the cash flows from Table 10.6, we can see in which year the payback occurs. To calculate the payback, add the NPV from Year 2 to Year 1, and then from Year 3, and so on.

Table 10.8 - Payback Period for Alternative 2

Year	Discounted Cost (DC) RAACxDF	Discounted Benefit (DB) ABxDF	Net Present Value (NPV) DB - DC	Cumulative NPV (Payback)
1	516,476		-516,476	-516,476
2	581,418	632,450	51,032	-465,444
3	543,386	844,400	301,014	-164,429
4	507,799	789,100	281,301	116,871
5	493,400	737,500	244,100	360,971
Total	2,642,479	3,003,450	360,971	

For Alternative 2, the payback period is somewhere between Year 3 and Year 4, when the Cumulative NPV crosses \$0. In conclusion, despite a positive Discounted Net beginning in

Year 2, the investment doesn't provide value until Year 4.



10.2.10 Evaluate Alternatives and Select Solution

Net Present Value, Return on Investment and Payback Period all should be taken into consideration when evaluating the alternatives. The clear choice based on NPV alone may not be so clear when the payback period is taken into consideration.

For example, the Return on Investment for Alternative 1 is clearly the best. Benefits outweigh costs by 50%. However the payback period may be later in life than the other two alternatives.

After a clear winner is determined by evaluating the alternatives using numeric data, evaluate the alternatives again using intangible data, and what strategically makes sense.

For example, if Alternative 1 is the current as-is process, despite having the highest ROI of 1.5, is it strategically the best alternative for the Agency? What if one of the other Alternatives is an E-Government initiative? Or will bring the Agency in line with the FEA? It's possible that the alternative with the highest return simply isn't the best strategic solution.

10.3 Summary of Steps

Cost Benefit Analysis is a time-consuming and detailed evaluation that results in selection of an investment alternative. Using a spreadsheet program to develop the tables and link the calculations makes the process easier and more accurate. These tables can be used cycle after cycle as new variables are filled in.

Here is a summary of the steps, and how one leads to the next.

Step 1 – Define the investment objectives.

Step 2 – Document solution requirements and map the solution to the requirement using a table.

Step 3 – Select at least three alternatives that will provide the functionality, as shown in Table 10.1.

Step 4 – Collect cost data for the system components identified in Table 10.1, for each alternative identified in Step 3.

Step 5 – Estimate the cost for each alternative by transferring the system components from Table 10.1 into a new table, and mapping the cost element for each component in that new table. See Table 10.2 as an example. The result is identification of the cost for each element of each system component, and traceability back to solution requirements.

In a second new table, map the annual cost to the fiscal years. The result is the cost of each System Life Cycle phase by Fiscal Year. See Table 10.3 as an example.

In a third new table, transfer the cost elements and map the cost elements to the system life cycles. The result is cost of each System Life Cycle phase in total. See Table 10.4 as an example.

Step 6 – Estimate the benefits for each alternative. Calculate the dollar value of benefits by Year.

Step 7 – Document all cost and benefit assumptions for each alternative.

Step 8 – Calculate the annual risk adjustment and the risk adjusted costs by year. See Table 10.5 as an example.

Step 9 - Calculate Return on Investment for each alternative. Subtract annual costs from annual benefits to get a net annual cash flow. Apply DRs obtained from OMB to the net annual cash flows, resulting in the Net Present Value. See Table 10.6 as an example. Calculate the Return on Investment for each alternative. See Table 10.7 as an example. Calculate the payback period for each alternative. See Table 10.8 as an example. Validate assumptions if required.

Step 10 - Evaluate and Select. Using the Net Present Value, the Return on Investment and the Payback Period, select the best alternative. Take intangible benefits into consideration if required.



11 Appendix F – Risk Assessment

11.1 Purpose

Risk is part of any capital investment. Identifying and controlling risks during the Select Phase can have a significant impact on the investment's overall success. However, risk is not the only consideration for investment evaluations. Investments with high technical risk may be selected if the investment is deemed a strategic or operational necessity. Other investments may be selected simply because they have low risk and require few resources. Conducting a risk assessment and controlling risk is a continuing process throughout the investment lifecycle, and is required at EPA.

11.2 Process

The risk evaluation process contains three steps:

1. Identify risks
2. Analyze risks
3. Control risks

11.2.1 Identify Risks

The OMB requires that all IT investments are evaluated against a list of 19 risks. Those risks are:

1. *Schedule* – the project schedule slips.
2. *Initial Costs* – actual costs exceed estimates.
3. *Life-cycle Costs* – actual costs exceed estimates.
4. *Technical Obsolescence* – the technology chosen becomes outdated prior to the end of the life-cycle, and the return on investment isn't realized.
5. *Feasibility* – the selected alternative is wrong.
6. *Reliability of Systems* – the system doesn't meet uptime standards and expectations.

7. *Dependencies and interoperability between this system and others* – success of this investment relies heavily on the success and continuation of other systems.
8. *Asset Protection* – the investment is difficult to protect, for example it is located in an unsecured building.
9. *Risk of Creating a Monopoly for future procurements* – the investment relies on one contractor for operations and maintenance, so costs cannot be controlled.
10. *Management Capability* – the Agency does not have the capacity to manage the investment and surrounding processes and systems.
11. *Risk of Failure* – the investment has a high probability of not closing the mission gap and will not return the benefits expected.
12. *Organizational and Change Management* – employees are resistant to learning new processes and accepting the new investment.
13. *Business* – decision to develop and implement the investment is a bad business decision.
14. *Data/Information* – success of the investment relies heavily on accurate data and information.
15. *Technology* – success of the investment relies heavily on technology components.
16. *Strategic* – the investment will not close mission performance gaps.
17. *Security* – protected data may be compromised. Classify the risks here as high, medium or basic.
18. *Privacy* – data contained in the system is regulated by privacy laws and require special planning.
19. *Project Resources* – the development of the system relies heavily on specific project resources, or required resources are scarce.

Risk identification consists of determining and documenting to what extent, if at all, these 19



risks will impact the investment. The identification and associated analysis is a continuing process that should be done periodically throughout the investment lifecycle. To identify the risks, look at both internal and external factors.

Internal risks are those that can be directly controlled within the project. Use mechanisms such as historical information, work breakdown structure (WBS), project plans, risk checklists, and interviews to identify internal risks. Internal risks should then be grouped into the following risk areas:

Financial Risk—Risks that could result in additional, unexpected funding, such as scope creep, sponsorship changes, cost overruns, legal dispute outlays, cost of lost information/data, hardware/software failure and replacement, cost to correct design errors or omissions, and potential cost of relying on a single vendor.

Technical Risk—Risks caused by inaccurately predicting the investment's lifecycle. These can result from a failure to attain expected benefits from the investment, inaccurate investment cost or duration estimates, failure to achieve adequate system performance levels, failure to adequately integrate a new system with existing hardware and software, or failure to integrate organizational procedures or processes. Technical risk can be determined by the following factors:

- Investment Size:
 - Number of project team members
 - Project duration
 - Number of organizational agencies involved in the investment
 - Size of programming effort (e.g., hours)
- Investment Structure:
 - Complexity of effort (e.g., number of interfaces with other systems, etc.)
 - Security vulnerabilities
 - New system or renovation of existing system(s)

- Organizational, procedural, or personnel changes resulting from the system
- User perceptions and willingness to participate
- Management commitment
- Level of user involvement
- Project team's familiarity with:
 - Proposed business or application area
 - Target development environment, tools, and operating system
 - Development of similar systems
- User group's familiarity with:
 - System development process
 - Proposed application or business area
 - Similar investments
 - New technology

Operational Risk—Risks associated with the policies, procedures and processes of the Agency. For example, how well the IPT works as a team.

Schedule Risk—Whether or not the investment is completed and implemented in accordance with original estimates. Concerns may include governmental regulation deadlines, project management experience, schedule timeframe, resource availability and competency, and contractor capabilities.

Legal and Contractual Risks—The investment ramifications that could result from developing an information system. Risks increase when outside organizations are involved. Risks may include, but are not limited to:

- Contract protests
- Copyright infringements
- Non-disclosure
- Labor laws
- Foreign trade regulations (limiting encryption techniques)
- Financial reporting standards
- Software ownership in joint ventures
- License agreements



Organizational Risk—Risks associated with key stakeholders and their view of the investment. Redistribution of power is the single greatest element that will increase organizational risk. Increasing stakeholder buy-in lowers organizational resistance to change.

11.2.2 Analyze Risks

Analyze each risk based on an assessment of likelihood and impact. Numerous activities are used to analyze risks and obtain a complete risk assessment to aid in developing risk management and control strategies. The following provides a summary of activities to assist in risk analysis:

- Group similar and related risks into categories to assist in identifying related risks as well as identifying potential dependencies between risks.
- Determine risk drivers or variables that affect the probability and impact of identified risks.
- Determine the root cause or source of risk.
- Use risk analysis techniques and tools such as simulation or decision trees to assess trade-offs, interdependencies, and timing of identified risks.
- Estimate risk factor or risk exposure. Multiply probability of occurrence or likelihood with the consequence or impact (in financial terms) if the risk occurred. See

Appendix E – Cost Benefit Analysis and Alternative Selection.

- Rank and prioritize risks.

CPIC documentation requires that a Risk Inventory and Assessment be completed and updated for each CPIC phase and submission. Use the template provided in the Exhibit 300. The table below represents the information in the Exhibit 300.

- Date Identified is the date the risk was discovered.
- Area of Risk is the risk category, based on similar characteristics. See section 11.2.1 for examples.
- Description is the actual risk itself.
- Probability of Occurrence is expressed in terms of high, medium and basic. This probability is also used to calculate risk-adjusted costs in the alternatives analysis. EPA recommends these ranges for the calculation: High is 66% - 100%. Medium is 34% - 65%. Basic is 0% - 33%.
- Strategy for Mitigation is the steps the Project’s Sponsor or Manager will take to reduce the probability of the risk occurring.
- Current Status is how far along the Strategy for Migration is, or the steps remaining in the mitigation plan.

Table 11.1 - Risk Inventory

Date Identified	Area of Risk	Description	Probability of Occurrence	Strategy for Mitigation	Current Status
07/01/03	Financial	Business Rules continue to change, resulting in higher development fees.	Medium	Ensure integrator has valid business rules, reduce rework.	In Progress
08/15/03	Schedule	Developers are spread out across buildings and off-site due to space restrictions. Communication is restricted.	High	Develop intranet site for project management and code library.	Completed
08/15/03	Technical	Financial system replacement requires a lot of customization.	Medium	Ensure integrator is highly skilled.	Completed



11.2.3 Control Risks

Developing and executing a strategy for migration is part of controlling risks. The development of a risk management plan assists in addressing each risk and whether to accept, avoid, transfer, or reduce the impact of the risk, including determining risk controls based upon available resources and identifying responsible parties.

Plans should include identifying the appropriate risk control strategy, objectives, alternatives, mitigation approach, responsible parties, resources required, activities, actions taken to date, and results achieved.

As the risk management plan is an evolving strategy that ensures a higher probability of success for the investment, it should be updated continually as risks change throughout the lifecycle.

Risks can rarely be completely eliminated, however they can be controlled. If the following controls or risk mitigation strategies are in place, the likelihood of risk decreases.

11.2.3.1 Financial Controls

- Perform Cost Benefit Analysis
- Implement a rigorous investment management program
- Utilize Earned Value Management, share in savings and other contracting approaches, to help control costs
- Purchase liability insurance
- Establish clear benefits to be realized
- Use competitive bidding for each investment design increment

11.2.3.2 Technical Controls

- Reengineer the process first;
- Use development lifecycle methodology/structure
- Use project planning/management software
- Use appropriately trained personnel;
- Divide the investment into increments;
- Isolate custom design portions of the investment

- Assign a Project Manager (preferably with Project Management Institute or similar organization certification) to be accountable for the investment
- Conduct pilot tests

11.2.3.3 Operational Controls

- Use a strategic information management framework
- Establish clear requirements and objectives
- Use a change management program to minimize organizational disruption
- Adequately train organization and provide follow on support
- Establish performance metrics and monitor metrics using a reporting system
- Establish a communication plan

11.2.3.4 Schedule Controls

- Use contractual incentives for quality or timeliness
- Use contractual penalties for missed deadlines
- Use contractual incentives for meeting or beating deadlines
- Use project management software
- Use an experienced/certified Project Manager and/or provide the necessary training to the Project Manager
- Set realistic expectations and manage those expectations;
- Use outsourcing to augment scarce internal resources.

11.2.3.5 Legal and Contractual Controls

- Create a software license management program
- Review all applicable laws
- Apprise contracting personnel of potential legal concerns and contract disputes
- Maintain communication with contractors to minimize contract disputes
- Provide multiple termination opportunities within a contract



11.2.3.6 Organizational Controls

- Obtain “buy-in” from top management early in planning stages
- Work closely with end-users to establish system requirements
- Maintain good communication with all stakeholders



12 Appendix G – Building the Project and Funding Plan Tables

12.1 Purpose

Throughout the investment's development the QIC and the OMB are looking for areas that may affect funding and ROI. The Project (Investment) and Funding Plan section of the Exhibit 300 is designed to capture the baseline milestones of the investment's development and any changes to that baseline. Changes to baseline milestones may indicate:

- Cost slippages
- Schedule slippages
- Addition or reduction to project scope

12.2 Tables

EPA's CPIC process allows business case submission to be completed on the Exhibit 300 of the OMB's circular A-11. In the Exhibit 300, the Project and Funding Plan section is made up of:

- Three tables that list project milestones, schedules, and costs

- The EVMS table and calculations
- Other questions related to EVMS. EVMS is discussed in Appendix I

This appendix covers how to successfully complete the three milestone tables, which are:

1. The original baseline
2. New baseline with OMB-approved changes
3. Actual outcomes compared to approved baseline

12.3 Process

The first table contains the original milestones, costs and schedules for the project. Ideally, these milestones are developed and submitted for the first time during the CPIC Select Phase.

For projects that are coming into compliance with EPA's CPIC process, document the current project plan. This table should never change. A sample table is shown below:



Table 12.1 - Original Baseline

Cost and Schedule Goals: Original Baseline for a Phase/Segment/Module of Project					
Description of Milestone	Schedule			Planned Cost	Funding Agency
	Start Date	End Date	Duration (in days)		
1. Conduct Architectural collaboration and develop EA plan.	1/02	6/02	180	50,000	EPA
2. Validate User Requirements and create Use Cases	3/02	3/03	360	100,000	EPA
3. Develop User Interface Screens	4/03	9/03	180	200,000	EPA
4. Integrate UI Screens with Call Module Code	11/03	1/04	90	50,000	EPA
Completion date: January 2004				Total cost estimate at completion: \$400,000	

Regardless of the CPIC phase the business case is in, if the project calls for changes to the milestones, the estimated cost or the schedule, the modified plan is placed, in its entirety, in the second table. A sample table is shown below.

In this example, if a milestone needed to be added to the baseline, 5 milestones would appear Table 12.2. If a milestone needed to be removed, 3 milestones would appear in Table 12.2. If there were no additions or deletions to the number of milestones, but the costs and schedules changed, 4 milestones would appear, but with different dates or planned costs.

The updates to the plan shown in Table 12.2 are considered proposed until the QIC and the OMB approve them. Once approved, this new plan remains unchanged until a need for modification.

In the example, let's say that Milestone 4 needs to be removed, and that the UI Screens will be tested as part of Milestone 3. Due to this change, the schedule for Milestone 3 will extend from 180 days to 270, and the cost will increase to \$250,000. The total number of days and the cost of \$400,000 remain the same, but the projected end date is backed up to November 2003. The new project plan is proposed below:



Table 12.2 - Proposed Changes to Base Milestones

Cost and Schedule Goals: Proposed <u> X </u> or Current (OMB-Approved) _____ Baseline for a Phase/Segment/Module of Project					
Description of Milestone	Schedule			Planned Cost	Funding Agency
	Start Date	End Date	Duration (in days)		
1. Conduct Architectural collaboration and develop EA plan.	1/02	6/02	180	50,000	EPA
2. Validate User Requirements and create Use Cases	3/02	3/03	360	100,000	EPA
3. Develop User Interface Screens and Test	4/03	12/03	270	250,000	EPA
Completion date: November 2003				Total cost estimate at completion: \$400,000	

Be sure to explain the reasons for the changes. For example, a reason for this phase having the same amount of cost for a shorter duration is because the total effort of 810 days remained the same.

In the example, this plan with these changes, has not yet been approved, so the “Proposed” line in the table header is “X’d”. Had the plan been previously approved, the “OMB-Approved” line would have been “X’d”

The OMB guidance for these tables states that only milestones for the current funding phase be included, however the IIS and the QIC require that the entire project is show so they can review the entire project plan to ensure that it was developed in accordance with EPA System Life

Cycle guidelines. Additionally, including the entire project plan will show that changes to the plan are properly cascaded through all tasks and milestones, and that earned value management metrics are calculated for the entire investment, not just a small piece of it. As a general rule, EPA wants to see the entire picture of the project as much as possible.

The third table is used to compare actual costs and schedule results against the baseline. In the example, let’s say that Milestones 1 and 2 are completed, but not as originally anticipated. Milestone 1 went slightly over schedule, Milestone 2 was completed on time and within budget. Milestone 3 is on schedule and budget.



Table 12.3 - Actual vs. Baseline

Comparison of OMB-Approved Baseline and Actual Outcome for Phase/Segment/Module of a Project									
Description of Milestone	OMB-Approved Baseline					Actual Outcome			
	Schedule			Planned Cost	Funding Agency	Schedule		Percent Complete	Actual Cost
	Start Date	End Date	Duration (in days)			Start Date	End Date		
1. Conduct Architectural collaboration and develop EA plan.	1/02	6/02	180	50,000	EPA	1/02	8/02	100%	65,000
2. Validate User Requirements and create Use Cases	3/02	3/03	360	100,000	EPA	3/02	3/03	100%	100,000
3. Develop User Interface Screens	4/03	12/03	270	200,000	EPA	4/03	12/03	78%	156,000
4. Integrate UI Screens with Call Module Code	11/03	1/04	90	50,000	EPA	4/03	12/03	78%	39,000
Completion date: OMB-approved baseline: January, 2004						Estimated completion date: November, 2003			
Total cost: OMB-approved baseline: \$400,000						Estimate at completion: \$415,000			

If these tables are completed as described in this Appendix, the three variables for earned value can be calculated easily. Budgeted cost of work scheduled (BCWS), budgeted cost of work performed (BCWP), and actual cost of work performed (ACWP) can be completed. In this example, the analysis date is October, 2003

and the baseline from Table 12.1 is used to calculate BCWS, since the modified plan proposed in Table 12.2 has not yet been approved by the QIC and the OMB. For the BCWS calculation, the work for Milestone 4 has not started.

From Table 12.1. $BCWS = 50,000 + 100,000 + 200,000 = 350,000$

From Table 12.3. $BCWP = 50,000 + 100,000 + ((200,000+50,000) * 78\%) = 345,000$

From Table 12.3. $ACWP = 65,000 + 100,000 + ((200,000+50,000) * 78\%) = 360,000$

Based on BCWS from Table 12.1, the project should have three milestones completed at a cost of \$350,000.

The actual work performed to date had a budget (BCWP) of \$345,000, indicating a schedule slip – the project behind in schedule for Milestone 3 because we have added the work for Milestone 4 –originally it was expected that \$200,000 would be spent by October, 2003, but only \$195,000 has been spent.

After calculating the actual cost for the actual work performed (ACWP), the schedule slip for Milestone 1 cost the project an additional \$15,000.



13 Appendix H – Enterprise Architecture and E-Government

13.1 Enterprise Architecture

13.1.1 Purpose

As with a house or the human body, different systems work in their entirety, with a distinct purpose, and in conjunction with each other to make the whole function efficiently. For example, a house is made up of: a structural system, a plumbing system, a heating system, a security system, an electrical system, etc. Business organizations are made of up complete and distinct systems that work together to create an efficient architecture: a technology system, a system of business processes, a data organization and maintenance system, a security system, a system to retrieve data that makes it meaningful (applications), etc. If one system isn't well designed, or isn't effectively integrated with the others, the business will risk its resources dealing with the constraints of a poorly-functioning system within its architecture. The systems rely on each other, with technology being the supporting foundation of the "house." The picture below shows the main systems that make up a successful EA.

The Federal Government has defined five systems that make up what an Agency's EA should be. These five systems will be published in documents called reference models. The five are:

1. Performance Reference Model (PRM)– describes ways to enhance performance information and how to describe performance in strategic terms.
2. Business Reference Model (BRM)– describes the lines of business and internal functions that are performed by the federal government.
3. Data and Information Reference Model (DIRM)– will describe the common types of data that are exchanged within the federal agencies and between the federal government and citizens.

4. Service Component Reference Model (SRM)– describes commonly used business processes and functions that represent an IT system.
5. Technical Reference Model (TRM)– provides details and definitions of current and emerging e-business technologies and the platforms they run on.

Of the five, the BRM, SRM and TRM have been published. Agencies are required to create their own EA reference models, and compare them to those of the Federal Government. This alignment is the responsibility of the Chief Architect, and is not part of the CPIC process.

As part of the CPIC process, business cases must map investments to the PRM, BRM, SRM and TRM. Use the EA section of the Exhibit 300 as a basis for the EA evaluation. During the Evaluate Phase, the new investment's alignment with the Agency's EA is critical in proving that EPA will invest new funds into projects that support PMA, FEA and the Agency's E-Government goals and objectives. The Control Phase should focus on whether any of the baseline PMA, FEA or EPA goals have changed, and if the project should be redesigned to reflect those changes. During the Evaluate Phase, steady-state projects must go through an E-Government review to ensure that they either remain aligned, or are eligible for Agency modernization funds. The next section explains what E-Government is, and provides the criteria for the mandatory E-Government review.

Investments also must map to EPA's Enterprise Architecture (EA). The EPA EA is comprised of a framework using the Federal Enterprise Architecture Framework (FEAF) and the Chief Information Officer Council's guidance. On the left is the hierarchical structure of the FEAF (Goals, Business, Data, Applications, and Technology). On the right is EPA's breakdown of



elements of the FEAF, showing the domain architectures and component architectures.

The domain architectures are: 1) the Environmental and Health Protection Architecture (EHPA), which supports regulatory and voluntary programs focused on environmental and human health protection; 2) the Research and Science Architecture (RSA),

which supports research and science activities, such as environmental assessments, toxicology studies, and risk management; and 3) the Administrative Systems Architecture (ASA), which supports the internal operations, service delivery, and infrastructure that enables EPA to achieve its environmental and health protection mission.

Figure 13.1 - Federal Enterprise Architecture (FEA) Reference Models

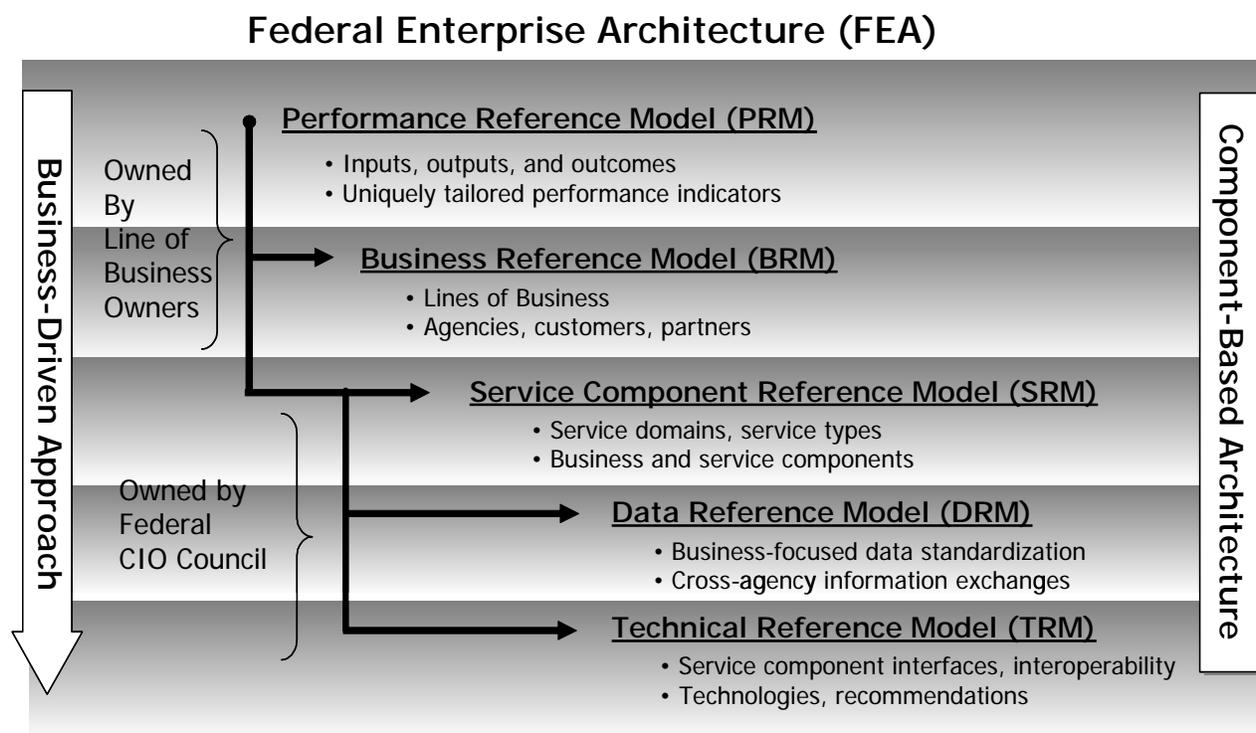
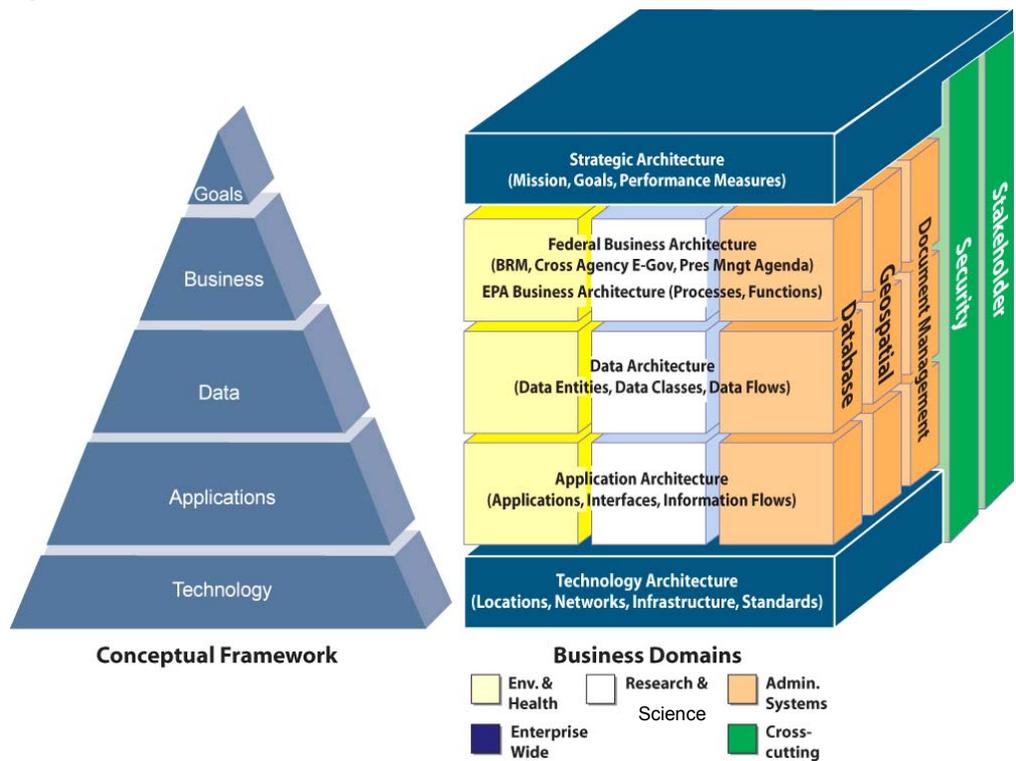




Figure 13.2 - EPA's EA Framework



13.2 E-Government

13.2.1 Purpose

The E-Government initiative began in July 2001 as an effort to use IT as a tool to eliminate wasted federal spending, reduce the paperwork burden on citizens and businesses and improve the government response time to citizens. E-Government is guided by three principles:

1. Investments must be citizen-centered
2. Investments must be results-oriented
3. Investments must be market-based

The E-Government program focuses on two efforts: modernizing IT investments through principles of E-Business and integrating IT investments across agencies to promote economies of scale.

The E-Government Act was signed by the President on December 17, 2002 and became effective on April 17, 2003. The Act:

1. Advocates a more citizen-focused approach to current government-wide IT policies and programs;
2. Establishes an Office of Electronic Government in the OMB to coordinate IT policy;
3. Formalizes the establishment of a CIO Council;
4. Permanently reauthorizes and amends agency information security requirements through the Federal Information Security Management Act (FISMA);
5. Protects the confidentiality of certain types of data across the government and allows key statistical agencies to share business data through the Confidential Information Protection and Statistical Efficiency Act (CIPSEA);
6. Supports activities that OMB and the executive branch are already pursuing under the PMA's expanding electronic government initiative.



13.2.2 Agency Plan

As a result of the initiative started in 2001, and in anticipation of compliance with the Act, the Agency has developed a strategic framework for meeting the challenges and opportunities of service delivery in an E-Government environment. EPA is involved in over half of the E-Government initiatives that span all four sectors of PMA.

In July, 2002, EPA released its Strategic Information Plan (the Plan), which outlines how it will achieve its goals and objectives for E-Government and provide government and citizens with fast, relevant, and integrated information to better protect human health and the environment. The Plan outlines six “over-arching” information management goals:

1. Use - Improve the use of environmental information to support decision-making, activity cost accounting, and results-based management;
2. Data - Collect appropriate data and provide high-quality and integrated information;
3. Technology - Strengthen EPA’s information infrastructure to improve Agency operations and the security, collections, and exchange of information;
4. Access - Enhance public access to useful and understandable information;
5. Governance - Adopt an enterprise-wide approach to make and implement information management decisions;
6. People - Invest in human capital.

13.2.3 Process

EPA’s existing and proposed IT investments will be evaluated to ensure that Internet-based and other electronic information, services, and program delivery channels have been sufficiently considered. Investments must align with EPA business goals and objectives and EPA’s E-Government mission, vision, goals, and objectives.

New and existing investments must be evaluated against a comprehensive set of criteria. Use the questions below as a basis for the evaluation.

13.2.3.1 PMA

Does the investment support the President’s Management Agenda item of Expanding Electronic Government?

13.2.3.2 EPA Business Goals, E-Government Goals

- Does the project make use of IT and its practical applications in re-engineering traditional government processes? Are they consistent with the goals and objectives of the Strategic Information Plan?
- Does the investment support:
 - Government to Citizen services
 - Government to Government services
 - Government to Business services
 - Internal Efficiencies
- What level of changed service delivery is provided by the IT investment? Does it provide information only, does it allow the customer to interact or transact business, or does it transform the business?

13.2.3.3 Collaboration:

- Does this investment support one agency, multiple agencies, or the entire Federal Government?
- Does the investment leverage existing or proposed IT investments?
- Does the investment unify and simplify program delivery and eliminate redundancy in system development and information and data collection efforts?
- Does the investment use an E-Government Service Delivery Channel? If so, does the proposal describe how other delivery channels will still be supported and describe the scheduled phase out of these services, if applicable? If this investment is not using an E-Government/Internet-based delivery channel for any of its end-to-end processing, why not?
- How will improvement to end-to-end processes and “e” enabling them provide value to external customers and/or internal improvements in efficiency and effectiveness?



- Does the investment enable sharing of information more quickly and conveniently between EPA employees and agencies and/or federal and state, local, and tribal governments?

13.2.3.4 Planning & Assessment

- Does the investment provide for increased customer-centered government? Who are the customer groups with the greatest impact?
- Has business process reengineering been conducted?
- Has the readiness of customer groups been determined? What is the current baseline of electronic services users? What is the projected user base at 6, 12, and 18 months after implementation?
- Does the investment address legislative priorities, GAO material weaknesses, OMB guidelines, or IG findings?
- Does the investment identify, examine and employ, where appropriate, industry best practices?
- Does the investment reduce the reporting burden on citizens, public and private entities and employees? For information collection from the public, does the investment identify the information collection package control number and associated forms numbers and title and the level of the service provided, (i.e., print, fill, save, submit, transmit)?
- Does the investment expand the reach and participation of EPA programs (i.e., increase the numbers of beneficiaries)? Does the proposed investment generate revenue, if applicable?
- Does the investment describe the information and records to be created and the associated records management requirements from creation to disposition, such as records scheduling, migration, etc.?
- Does the investment identify performance measurements associated with the E-Government delivery channel?

13.2.3.5 Change Management Component:

- Does the proposal include a change management component?
- Does the investment address the awareness and training requirements to effect change?
- Has the proposal considered governance, communications, training and other change management needs?

13.2.3.6 Citizen-Focus

- Have specific performance measures and indicators that are geared to citizens' needs been identified?
- Does the investment deploy existing or create easy-to-find points of access to EPA services such as FirstGov.gov?
- Will a marketing or communications plan promote the products and services to the public, to other government agencies and business partners?

13.2.3.7 Budget/Finance

- Does the investment reduce or eliminate redundant expenditures within EPA?
- Can multiple agencies collaborate or pool resources?

13.2.3.8 Architecture and Infrastructure

- Does the investment describe the technology components required to support this investment, (e.g., web browser, web server, e-signature, etc.)?
- Does the investment advance IT priorities in the areas of EA, telecommunications, and information management?
- Have security-related components been addressed and coordinated?
- Does the investment focus toward using web service technologies such as XML, J2EE or .NET?



14 Appendix I – Earned Value Management

14.1 Purpose

Earned Value Management (EVM)⁸ is a program management technique that uses an investment's past performance and work as indicators of the investment's future, enabling the project's management team to evaluate and gain insight into its actual schedule and financial progress.

The OMB requires that EVM be used on all major IT investments, and EPA has also followed that requirement with its CPIC process and documentation. EVM uses historical costs and completion dates to see into the future, allowing a quick determination if the project is on schedule, and within budget. If it isn't, corrective measures can be taken to get the project back on track.

The earned value methodology requires an investment to be fully defined at the outset. The minimum amount of information that is required to implement EVM includes:

- Planned investment start and end dates
- Total investment budget
- List of milestones with planned start and end dates
- Budgeted percentage of work performed for each milestone
- Planned expenditures for each milestone

This approach provides accurate and reliable assessments from as early as 15 percent completion of the investment's lifecycle. Studies show that investments that are over budget at this point will result in cost overruns.

Studies also show that once a cost overrun is identified, it can generally be reduced by only 10

⁸ Additional information and guidance on EVM is available on EPA's CPIC website at <http://intranet.epa.gov/cpic/laws.htm>

percent, which indicates the need to support early awareness of potential cost and schedule risks. Early investment assessment and identification of cost and schedule variances is critical for the overall success of the investment, and supports improved cost and schedule control.

14.2 Process

Before beginning the process, become familiar with the terms and concepts of earned value.

Earned value is a series of simple calculations that result in a variance between what was originally planned, and what actually happened.

EVM concentrates on cost and schedule. Terms used are:

1. **Budgeted Cost of Work Scheduled (BCWS)** – ESTIMATED amount of work, and ESTIMATED amount of cost to do that work: the baseline.
2. **Actual Cost of Work Performed (ACWP)** – ACTUAL cost incurred to accomplish the ACTUAL work that has been done to date: the expenses.
3. **Budgeted Cost of Work Performed (BCWP)** – ESTIMATED cost to complete the ACTUAL work that has been done: what the cost should have been for completed work.

Before beginning to use earned value management, complete the following project management tasks (see **Appendix K - Project Management**):

- Develop a WBS
- Define investment activities
- Allocate costs to each WBS element
- Schedule each activity
- Evaluate the investment's status



Once this initial work is completed, it will be easier to periodically assess the investment's performance and complete the following four steps in the earned value management process.

14.2.1 Update the Schedule

Update scheduled activities when they are started, completed, or with the remaining duration as of the analysis date. For unfinished activities, report the percentage of completion is.

Work that results in concrete deliverable products (e.g., reports, studies, briefings, etc.), is easily measured. For work that isn't easily measured, use a special "earning rule." A common "earning rule" is to report percent complete according to completed milestones within an activity.

14.2.2 Record Actual Costs

After updating the schedule, record actual costs from the investment's accounting system, or provide estimates.

14.2.3 Calculate Earned Value Measures

After recording the actual costs for the reporting period, calculate earned value measures for the required elements within the Exhibit 300.

Budgeted Cost of Work Scheduled (BCWS)—Sum all of the budgets for the work that was scheduled to be done as of the date of analysis.

Budgeted Cost for Work Performed (BCWP)—Sum all of the budgets for tasks or milestones that have actually been completed as of the date of the analysis. Add in any additional

cost for work in progress. Additionally, include any budget percentage of fixed overhead that is allocated to the investment.

Actual Cost of Work Performed (ACWP)—Using the same work performed assumption in the BCWP calculation, sum the actual expenses incurred for the work performed and the fixed overhead.

All of the required project summary values in the Exhibit 300 can be calculated using these three numbers. The chart in the next step provides an example of how to calculate the values.

14.2.4 Report on Earned Value

The OMB, via the Exhibit 300, requires that the following results be calculated and reported to project governance as well as the OMB during the annual budgeting cycle.

Using the following scenario, values are calculated:

A sample investment has a life cycle cost of \$10,000 with a completion date of 12 months beyond the analysis date. The baseline cost of work scheduled is \$1,000, the project is ahead of schedule by 20%, so the budgeted cost of actual work performed is \$1,200, but the project has exceeded its cost estimates, so the ACWP is \$2,000.

Therefore;
BAC = 10,000
BCWS = 1,000
BCWP = 1,200
ACWP = 2,000



Table 14.1 - Sample Investment Summary Chart

Project (Investment) Summary (Cumulative)	Calculation	Value
Cost Variance (CV) = (BCWP – ACWP)	1,200 – 2,000	-800
Cost Variance % = (CV/BCWP) x 100%	-800/1,200 x 100	-66.67%
Cost Performance Index (CPI) = (BCWP/ACWP)	1,200/2,000	.60
Schedule Variance (SV) = (BCWP – BCWS)	1,200 – 1,000	200
Schedule Variance % = (SV/BCWS) x 100%	200/1,000 x 100	20%
Schedule Performance Index (SPI) = (BCWP/BCWS)	1,200/1,000	1.20
Two independent Estimates at Completion (EAC): 1. ACWP + ((1/CPI) x (BAC – BCWP)) 2. ACWP + ((1/CPI x 1/SPI) x (BAC – BCWP))	2,000 + ((1/.60) x 10,000 – 1200) 2,000 + ((1/.60 x 1/1.20) x 10,000 – 1,200)	16,667 14,222
Variance at Completion (VAC) = BAC – EAC for 1 and 2 above	10,000 – 16,667 10,000 – 14,222	-6,667 -4,222
Variance at Completion % (VAC/BAC) x100% for 1 and 2 above	-6,667/10,000 x 100 -4,222/10,000 x 100	-66.7% -42.2%
Estimated Cost to Complete (ETC)	Range based on EAC	14,222 – 16,667
Expected Completion Date	Date based on Life Cycle	X Date

If this investment wasn't 20% ahead of schedule, the amount of funds needed to complete the lifecycle would be around \$16,667. But, since the project is ahead of schedule at this point, the amount of funding estimated is \$14,222. At this point in time, the project manager and Project Sponsor should ask themselves:

1. Why is the project ahead of schedule?

2. Why are the costs so far above estimates?

Possible conclusions may be that the project is overstaffed, and while the work is being completed quickly, it is costing too much. Possible corrective measures may be to replace more costly, senior project members with less costly, junior members, or maybe there are just too many people on the staff.



15 Appendix J - Conducting a Post Implementation Review (PIR)

15.1 Purpose

Post-Implementation Reviews are conducted as part of the Evaluation Phase of the CPIC process. PIRs are required by the OMB, and help determine whether investments have achieved expected benefits, such as lowered cost, reduced cycle time, increased quality, or increased speed of service delivery.

The PIR has a dual focus:

- It provides an assessment of the implemented investment, including an evaluation of the development process.
- It indicates the extent to which EPA's decision-making processes are sustaining or improving the success rate of IT investments.

Conduct the PIR between six and eighteen months after an investment has been implemented to provide adequate time to collect operating data and results.

If a project or investment is terminated, the PIR occurs immediately.

15.2 PIR Team

A team of fully trained personnel should conduct the PIR. However, in order to ensure the review is conducted objectively, the PIR team should be independent and only be assisted by members from the IPT under review.

Credibility of the review relies on the competency of the PIR team. Therefore, the team should be fully trained in conducting PIRs, should be led by an experienced project manager, should have access to supporting tools, and should have full Agency support.

Rely on tested and reusable tools such as templates, assessment methods and project plans. Additionally, ensure that the PIR team is

following the most recent EPA policies and procedures on how PIRs are to be conducted within the Agency.

The PIR team should review the following investment elements:

- Mission alignment
- EA alignment
- Performance measures
- Project management
- Customer acceptance
- Business process support
- IPT
- Cost versus anticipated savings

At a minimum, the PIR team will evaluate stakeholder and customer satisfaction with the end product, mission impact, and technical capability, as well as provide decision-makers with lessons learned so as to improve the investment decision-making process.

The review will provide a baseline to decide whether to continue the system without adjustment, to modify the system to improve performance or, if necessary, to consider alternatives to the implemented system. Even with the best system development process, it is possible that a new system will have problems or even major flaws that must be solved to obtain full investment benefits. The PIR should provide decision-makers with useful information on how best to modify a system, or to work around the flaws in a system, to improve performance and bring the system further in alignment with the identified business needs.

If the PIR is being conducted after an investment or project's termination, it should focus on the reasons why the investment failed and how the Agency can improve itself.



15.3 Process

As detailed below, there are four major steps in conducting a PIR. These steps are designed to follow GAO guidance in its report Information Technology Investment Management, A Framework for Assessing and Improving Process Maturity, May 2000, Version 1.

15.3.1 Initiate PIR

The PIR team initiates a review by preparing and sending a memorandum to the Project Sponsor stating the review has begun. The memorandum should include a schedule for the planned review and indicate any areas that may receive special review emphasis.

15.3.2 Analyze Quantitative Data

Quantitative data is easily measured with numbers. Quantitative data can include the dollar amount of costs, the dollar amount of benefits, the number of days to complete a task, the dollars associated with risks and the percentages or numbers associated with performance, to name a few.

The PIR team gathers quantitative data on cost, returns, risk, schedules and performance metrics from the IPT. Analysis involves conducting cost benefit analysis and analysis of project schedules and impacts that resulted in schedule slippages.

15.3.2.1 Cost Benefit Analysis

A review of the costs and returns begins with the cost benefit analyses provided in the Exhibit 300. The PIR team will review the analysis for each CPIC submission to ensure that the changes to the calculation are supported and that the calculation hasn't changed simply to show the investment in the best light.

Next, the team will audit the costs associated with the line items to ensure that they are reasonable and that no actual costs were left out of the calculation. Actual costs can be compared against historical organization data, market research, publications, and special studies for validity. The annual risk adjustment is audited using the same methodology, ensuring that the risk adjustment is reasonable.

Benefits are more difficult to quantify and must be tested to ensure that they were contributed solely by this investment. Percentage contributions must also be tested. The team will quantify increases in accuracy, availability, improved efficiency and reliability by estimating how much it would cost the Agency if the investment wasn't developed. External studies are used to validate the actual amounts associated with benefits for reasonability.

The DRs used in the Exhibit 300 submissions are audited to ensure that they are the correct rates issued by the OMB Circular A-94. New discounted amounts are recalculated, along with the return on investment. If there is a variance to estimate of 10% or more, the IPT should recommend corrective measures and develop the costs and benefits associated with those corrective measures.

$$\begin{aligned} & \text{Total Discounted Benefits} \\ & \text{Less Total Risk Adjusted Discounted Cost} \\ & \quad = \text{Net Present Value} \end{aligned}$$

$$\begin{aligned} & \text{Net Present Value} \\ & \text{Divided By Total Risk Adjusted Discounted Cost} \\ & \quad = \text{"Risk Adjusted" ROI} \end{aligned}$$

Many investment portfolios have minimum ROI criteria, and if the investment under review doesn't meet the minimum percentage, the PIR and IPT will need to develop corrective measures, as described above.

15.3.2.2 Performance Measurement Analysis

First, the review team will review the baseline performance measures to ensure that they are reasonable for this type of investment.

Next, the review team will use data gathered from the IPT, and validated by independent sources, to determine if the investment has actually performed to expectations. Note that many newly implemented systems may not have sufficient data to guarantee an accurate evaluation, so the experience of the PIR team with the investment and technology under review will add credibility to the evaluation. In the absence of certain statistics, the review team may perform onsite observations to measure specific criteria.



15.3.3 Analyze Qualitative Data

Qualitative data isn't as easily measured as quantitative data. Qualitative data includes items such as customer satisfaction, project justification, and technology assessments.

The PIR team gathers data on user requirements, project justification, decision factors, risk factors, and the solution design.

User requirements and customer satisfaction can be obtained by interviewing all stakeholders and collaborating partners. The interviews should help the team develop an understanding of the system's goals, objectives and benefits as described in the business case. Additionally, the interviews will help the team determine how efficiently and effectively the system's objectives, goals, performance measures, and benefits are being achieved, as well as identify system deficiencies and enhancement needs.

The PIR team will evaluate the technological solution to ensure that it was the best alternative available in terms of design, security, speed, reliability, and use of e-business technologies. It will also evaluate the process by which the decision was made to proceed with the chosen solution to ensure that the decision was independent and not coerced by internal or external forces.

The review team attains any existing investment documentation and analyzes the information to understand the investment scope, generate interview and survey questions, prepare for system overview briefings, and plan the PIR. The review team also reviews any existing reports and memos from prior CPIC cycles to uncover any findings or outstanding issues.

15.3.4 Issue Report

After comments are received from the Project Sponsor, the review team prepares the Final Report and submits it for the IIS, the QIC and OEI for review. Findings and recommendations must be clear, concise and well supported by all data gathered to avoid any misunderstandings. The report will be submitted as part of the Evaluate Phase of the CPIC process. It is hoped that corrective measures recommended as part of the PIR will be fully analyzed and planned for in the current CPIC cycle so any corrective measures identified or required can begin as soon as possible.

The PIR team may also develop process improvement suggestions for the review process, which should be submitted to OEI as part of the report.



16 Appendix K – Project Management

16.1 Purpose

Project Management is a crucial element for IT investment success. It involves executing management practices that will ensure successful investment development and implementation. Project Management involves areas such as project planning, scope management, cost, schedule, performance, risk, and organizational management. The Project Manager is ultimately responsible for the investment’s success and for ensuring that the investment delivers the functionality and capabilities expected by stakeholders. One of the greatest project management challenges is identifying risks and executing management techniques that mitigate the risks to ensure timely and successful completion.

16.2 Components

Project Management involves assessing and completing the following components to help ensure the investment’s successful completion.

16.2.1 Project Planning

Project planning provides a foundation on which to base anticipated efforts and related costs. Additionally, it helps identify investment components and illustrates these components in a project plan. Project planning includes:

- Scope definition
- Activity identification
- Activity duration estimation
- Activity sequencing
- Cost estimation
- Schedule development
- Project staffing/resourcing
- Work breakdown structure
- Project plan development

Investments typically involve multiple complex components that may interface with other proposed/existing systems or data. Integrating components can be challenging, so use a Work Breakdown Structure (WBS) to support

improved integration and management. A WBS provides a management framework by separating the investment lifecycle into distinct, manageable components related to various activities and interfaces. Each component is defined with appropriate activities and tasks. An individual or team is assigned to the lowest task level, which enables the Project Manager to more effectively estimate the cost and schedule for completing the individual components, supporting sequencing activities and identifying interdependencies. The WBS also provides a basis to identify milestones and develop resource and schedule estimates.

Table 16.1 provides an example of a WBS. The first column contains activity or task numbers. The second column contains the names of the activities or tasks. In the table, activity 100 is a high level activity. The lowest-level activities that need to be completed to “Define Project” are listed as activities 10 through 70. If the project manager decides to insert three detailed activities for “Define Project Scope” he or she would create new activities and number them 21, 22, and 23.

16.2.2 Scope Management

Scope management frames what is expected of the investment’s ultimate capability and functionality, directly impacting functional and system requirements development. After setting scope criteria, maintain requirements traceability throughout the project lifecycle and implement configuration management procedures to effectively manage scope creep. Project scope should be based on the business requirements identified during the Select Phase and traced throughout the project lifecycle. By continuously reviewing user requirements through the SLC and CPIC processes, project changes and risks, and ultimately scope, are managed.



Table 16.1 - Sample Work Breakdown Structure

Project Plan	
100	Define Project
10	Determine Project Objectives
20	Define Project Scope
30	List Project Products
40	Determine Project Constraints
50	Select Project Approach
60	Determine Project Standards
70	Assess Project Risks
200	Make Project Plan
10	Define Work Breakdown Structure
20	Determine Activity Dependencies
30	Define Project Milestones
40	Determine Project Organization
50	Estimate Effort
60	Allocate Resources
70	Schedule Activities
80	Develop Budget
90	Assess Project Risks
300	Obtain Project Approval
10	Assemble Project Plan
20	Present Project Plan
30	Agree to Project Plan
MPMP1	Milestone PMP1

Link system features, functions, and capabilities to original customer requirements throughout the entire planning, acquisition, design and implementation phases to ensure accurate system or network design. The work completed as part of the Cost Benefit Analysis forms a structure for this linkage. Refer to **Appendix E - Cost Benefit Analysis and Alternative Selection** for examples.

16.2.3 Risk Assessment

Risk is inherent in every investment so don't expect to eliminate risk completely. Expect to develop effective risk mitigation strategies, manage them actively, and adjust them to changes in internal and external pressures.

A Risk Inventory and Assessment is required during SLC Definition and CPIC Select, and

should be used as part of the project plan to ensure consistency. Refer to **Appendix F – Risk Assessment** for a tutorial on how to develop a risk mitigation strategy. Include the tasks and milestones from this strategy into the project plan.

16.2.4 Cost and Schedule Management

Effective investment management involves establishing cost and schedule baselines. Collect information, analyze, and compare it to original projections and the current baseline. Identify variances and take appropriate actions including communicating problems and corrective measures with senior management. Corrective measures should be recorded in the CPIC documentation in the Project and Funding Plan section of Exhibit 300. The OMB is requiring the use of Earned Value Management techniques and tools to identify cost and schedule slips early enough to correct. Refer to **Appendix I – Earned Value Management** as a tutorial on how to complete this part of the business case and project management.

16.2.5 Performance

An investment's ultimate objective is to meet or exceed the Agency's performance gap by ensuring the investment satisfies stakeholder performance expectations and business requirements. In the Select Phase, performance planning includes defining performance measures and identifying activities required to ensure performance objectives will be met (see **Appendix D - Performance Measurement**). This may include benchmarking to establish a baseline and to further refine the investment's performance objectives. The Control Phase includes a continuous monitoring of the performance baseline including quality reviews, tests, or pilot tests. In the Evaluate Phase, a PIR helps compare actual investment performance with expectations (see **Appendix J - Conducting a Post-Implementation Review**). Performance management is a continuous activity that evaluates how well the investment and IPT perform.



16.2.6 Organizational Management

Organizational management skills needed to manage an investment include project staffing, communications, and organizational understanding. Project Managers should be able to identify the needed skill sets and assign appropriate personnel to accomplish a given set of activities. Project Managers should also have the requisite interpersonal and leadership skills

to communicate with both the project team and stakeholders, including possessing a vision for the investment and how to best meet stakeholder expectations, as well as ensuring the project team is able to focus on assigned tasks/activities. Additionally, Project Managers should be able to communicate and build consensus with key stakeholders, since this ultimately impacts the investment's success or failure.



Document Control

Date	Version	Section	Reason	By
11/14/03	1.0	All	Completed	OEI
3/23/04	2.0	All	Incorporates new information, and changes in information contained in version 1.0	OEI
3/31/04	2.1	All	Incorporates OEI CPIC Team changes	OEI
4/28/04	2.2	All	Incorporates OEI CPIC Team changes, including a new Executive Summary	OEI
5/7/04	2.3	Executive Summary	Incorporates additional OEI changes	OEI
6/29/04	2.4	All	Change from Draft Interim	OEI
7/1/04	2.5	Various	Incorporates additional OEI Senior Management changes	OEI
7/8/04	2.6	5	Incorporates EPA Security Intranet Site Link	OEI

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