

## CHAPTER 17 - SYSTEM LIFE CYCLE MANAGEMENT

1. PURPOSE. This policy establishes the life cycle requirements of EPA's automated information application systems. Roles and responsibilities for implementing these requirements are also delineated. Observance of these requirements will ensure full value is obtained from Agency investments in data and information systems.
2. SCOPE AND APPLICABILITY. All automated information application systems that are developed, produced or maintained by or for the EPA are subject to this policy. Formal review requirements vary according to system category (see Exhibit 17-A). This policy applies to all EPA organizational units and their employees. It also applies to agents of the EPA who support the initiation, analysis, design, development, operation and retirement of Agency information systems.
3. BACKGROUND.
  - a. The Agency depends on information to accomplish its mission. EPA's data and information systems are among its most valuable assets and are critical to the Agency's ability to provide the public with access to environmental information.
  - b. Development of information systems is difficult, and often complex and expensive. Agency system life cycle management requirements are designed to meet applicable Federal requirements, ensure management involvement at key decision points, obtain and sustain corporate commitment for information systems, and coordinate information systems-related activities.
  - c. System life cycle management promotes involvement by users, program managers and information resource managers in system development and enhancement efforts. It establishes a process by which Agency managers are directly accountable for making key decisions about how resources are expended for system development and enhancement efforts.
  - d. EPA relies frequently upon contractors and other agents for assistance in building and operating its information systems. System life cycle management establishes practices and periodic review requirements that mitigate the uncertainties involved in using

extramural support.

- e. EPA is committed to managing its information systems in a cost effective manner and ensuring its systems meet mission needs. Using guidance provided by oversight agencies including the Office of Management and Budget (OMB), the General Services Administration (GSA), and the General Accounting Office (GAO), the Agency conducts periodic reviews to assess how well its systems are meeting these key objectives.

4. AUTHORITIES.

- a. 44 U.S.C. Chapter 35, Paperwork Reduction Act of 1986.
- b. EPA Hardware and Software Standards.
- c. Federal Records Act of 1950, as amended (44 U.S.C. Chapter 3101-3107, Records Management by Federal Agencies).
- d. OMB Circular No. A-11, Exhibit 43, Data on Acquisition, Operation, and Use of Information Technology Systems, May 28, 1986.
- e. OMB Circular No. A-130, Management of Federal Information Resources, June 25, 1993.
- f. FIRMR 201-2, Designated Senior Officials.
- g. FIRMR Subchapter B, Management and Use of Information and Records, Part 201-6, Predominant Considerations.
- h. FIRMR Subchapter C, Management and Use of FIP Resources, 201-17, Predominant Considerations.
- i. FIRMR 201-22, Review and Evaluation.

5. POLICY.

- a. All information systems shall support the mission of the Agency. Plans for information systems shall be included in Agency and organizational budget and planning processes as appropriate (see Chapter 2 on Mission-Based Planning).
- b. System life cycle management at EPA is based on a set of generic stages in a typical system development or enhancement project. EPA does not require use of a

specific system life cycle methodology, as this would be unduly restrictive when uniformly applied across the wide range of EPA's varied information systems development and enhancement projects.

c. The generic information system life cycle at EPA consists of eight major stages:

- (1) Initiation - a request for the development of a system to meet a need for information or to solve a problem for the individual making the request.
- (2) Requirements analysis - determination of what is required to automate the function(s) identified by the organization.
- (3) Design - the stage that specifies the automated and manual functions and procedures, the computer programs, and data storage techniques that meet the requirements identified and the security and control techniques that assure the integrity of the system.
- (4) Programming - coding of the program modules that implement the design.
- (5) Testing and quality assurance - ensuring that the system works as intended and that it meets applicable organization standards of performance, reliability, integrity and security.
- (6) Installation and Operation - incorporation and continuing use of the new system by the organization.
- (7) Maintenance/enhancement - Resolving problems not detected during testing, improving the performance of the product and modifying the system to meet changing requirements. (Full-scale enhancements require full life cycle analysis.)
- (8) Retirement - the stage which ends use of the system.

New systems development and enhancement/replacement projects must go through these eight major stages noted above. Systems may cycle through various stages multiple times. Developers of EPA information systems shall consult with the intended user community throughout the systems' life cycle to ensure the system

is meeting mission needs.

- d. The way a specific methodology is applied to the generic life cycle must be documented (see section 5.e (2)d).
- e. Appropriate levels of management shall review and approve or disapprove system development or enhancement\replacement projects. These reviews by management shall occur, at a minimum, at the end of each stage of the generic life cycle as implemented for the chosen methodology. These management decisions shall be documented by means of signatures on formal decision papers. For new system development or enhancement projects, the first two decision papers have special characteristics.
  - (1) The System Charter decision paper, which is developed during the initiation stage of a new system development or enhancement project, shall document:
    - a) the information management and mission need(s) to be met;
    - b) the intended user community;
    - c) the sponsoring organization(s);
    - d) the projected time frame for the project;
    - e) the likely system category, based on expected scope and cost (see Exhibit 17-A);
    - f) a preliminary estimate of the range of potential life cycle costs;
    - g) the appropriate management levels for review and approval of decision papers; and
    - h) the manager of the system.
  - (2) The System Management Plan (SMP) decision paper shall be produced at the conclusion of the analysis stage and shall be updated as the project progresses. Exhibit 17-A sets forth required Agency management review levels for SMPs. The SMP shall subsume the System Charter and shall include

at a minimum:

- a) the system's purpose, mission need, and goals;
- b) the system's scope, including the system's funding organization(s), intended primary and secondary user community and any known or intended interactions with other systems;
- c) assumptions and constraints influencing the system;
- d) the life cycle methodology to be used in managing the system's life cycle and its key decision points;
- e) the appropriate levels of management review and approval;
- f) the projected date to begin operation and an estimate of total system life from initiation to retirement;
- g) an estimate of total life cycle costs, broken out by stages;
- h) an acquisition strategy and alternatives;
- i) a cost-benefit analysis including an analysis of technical alternatives;
- j) a description of the system's architectural context, technical requirements, anticipated security issues, platform and network capacity needs; and
- k) the system's data architecture, in compliance with Agency and Federal data standards.

(3) Following are the minimum contents required for formal decision papers other than those produced for the Charter and the System Management Plan:

- a) the current status of the system;
- b) an estimate of the cost of the next stage(s) for which approval is sought in the decision paper and an assessment of projected vs.

actual costs to date;

- c) a description of the work to be accomplished in the next stage(s) of the system development or enhancement project;
  - d) identification of any programmatic policy or procedural decisions needed to address constraints influencing the success of the next stage(s); and
  - e) an analysis of appropriate alternatives.
- (4) System Management Plans shall link appropriately with Agency and Organizational IRM Strategic and Multi-Year Implementation Plans.
  - (5) No more than 15% of the estimated cost of the next stage or \$250,000, whichever is less, may be expended prior to approval of the formal decision paper.
  - (6) The SMP shall be updated to reflect actual and planned changes as new system decision papers are approved and a baseline version of the SMP shall be retained for reference.
  - (7) Throughout the life cycle of the system, management of the system shall be conducted in accordance with the SMP, as updated.
- f. EPA personnel shall develop all decision papers to ensure government control over system decisions. EPA staff may use any and all available source material, including contractor-generated material, in the development of formal decision papers.
  - g. The EPA Executive Steering Committee for Information Resources Management (IRM) and all other EPA managers involved in reviewing system decision papers shall provide decisions within 30 days of receipt of the decision paper.
  - h. All systems shall be categorized in one of the following four types:
    - (1) Major Agency Systems,

- (2) Major AAship/Regional Systems,
- (3) Significant Program Office Systems, and
- (4) Local Office or Individual Use Systems.

Each category reflects a combination of factors such as the system's cost and organizational scope. See Exhibit 17-A for the specific thresholds which determine a system's category.

- i. The level of detail for decision papers shall be appropriate to the category of the system. The approving managers may establish more extensive decision point requirements for individual systems than required by this policy.
- j. All information systems shall comply with appropriate Federal and Agency IRM policies, standards, and procedures throughout their life cycles. Recognizing that legacy systems may not conform completely with current Agency architectures and standards, system enhancement projects shall move into conformance with these architectures and standards, as appropriate, as projects proceed.
- k. To maximize the return on the Agency's investment in its information systems, sufficient documentation is needed at each stage of the life cycle to support effective management of Agency resources and to facilitate the interchange of information among managers, developers, programmers, operators and users. The following are key documents (in addition to the system charter, system management plan, and decision papers) produced at different stages of the system life cycle:
  - (1) needs statement and initiation request
  - (2) feasibility study
  - (3) risk analysis
  - (4) cost/benefit analysis
  - (5) functional requirements analysis
  - (6) functional security and internal control requirements analysis
  - (7) data requirements analysis
  - (8) data management plan
  - (9) quality assurance plan

- (10) system/subsystem, program and database specifications
- (11) validation, verification and testing plan and specifications
- (12) system acceptance plan
- (13) schedules for each phase and records of schedule changes
- (14) user manual
- (15) operations/maintenance manual
- (16) installation conversion plan
- (17) test analysis and security evaluation report
- (18) software maintenance plan
- (19) post implementation review plan
- (20) evaluation and assessment of information system obsolescence
- (21) change control memos or forms
- (22) system security plan
- (23) disaster recovery plan

6. RESPONSIBILITIES.

- a. The Designated Senior Official (DSO) for IRM is responsible for establishing policies and procedures to implement all Federal IRM mandates including, but not limited to, the Paperwork Reduction Act of 1980 and its amendments (P.L. 96-511), Federal Information Processing Standards (FIPS), Federal IRM Regulations (FIRMR), OMB Circular No. A-130 (Management of Federal Information Resources), OMB Circular No. A-11 (Data on Acquisition, Operation, and Use of Information Technology Systems) and other Federal regulations.
- b. EPA's Executive Steering Committee for IRM is responsible for review and approval/disapproval of System Management Plans for systems which meet any of the following criteria:
  - (1) Mission critical for multiple AAships;
  - (2) Mission critical for multiple Regions;
  - (3) Agency core financial system;
  - (4) Estimated costs exceed \$25 million over the life of the system;
  - (5) Estimated costs exceed \$5 million in one year.

- c. The Assistant Administrators, Associate Administrators, Regional Administrators, Laboratory Directors, Headquarters Staff Directors, General Counsel, and the Inspector General are responsible for:
  - (1) Ensuring compliance with system life cycle management policies, procedures and standards.
  - (2) Managing the system life cycle, process and products within their organizations in compliance with Agency and Federal policy.
  - (3) Reviewing and approving/disapproving System Management Plans for systems sponsored by their organization which meet any of the following criteria:
    - a) Mission critical for their AA/ship or a joint mission critical project with another AAship or Region;
    - b) Agency core financial system;
    - c) Estimated to exceed \$10 million throughout the lifecycle or \$1 million in annual costs.
- d. The Senior IRM Officials (SIRMOs) for the organization(s) funding the project(s) are responsible for:
  - (1) Reviewing and approving/disapproving System Management Plans for systems sponsored by their AAship or Region;
  - (2) Coordinating all reviews and approvals outside the Office Directorship, such as the Executive Steering Committee for IRM, Assistant or Regional Administrator, and Director of the Office of Information Resources Management (OIRM).
- e. The Director, OIRM is responsible for:
  - (1) Reviewing and approving/disapproving System Management Plans for projects meeting any of the following the criteria before they go to the Executive Steering Committee for IRM:

- (a) Mission critical for one or more AAships or Regions;
  - (b) Agency core financial system;
  - (c) Estimated to exceed \$25 million over the life of the system or \$5 million in annual costs.
- (2) Conducting, at his/her discretion, additional system life cycle management reviews to complement the reviews required to be conducted periodically by system sponsors.
- f. The Director, National Data Processing Division is responsible for providing technical consultation to reviewers of System Management Plans concerning the description of the system's architectural context, technical requirements, anticipated security issues, platform and network capacity needs to ensure conformance with the Agency's technology architecture.
- g. System Sponsors are responsible for:
  - (1) Reviewing and approving/disapproving system decision papers.
  - (2) Conducting periodic system life cycle management reviews to evaluate costs and efficiency of operation, and ensure the system is continuing to meet mission needs.
- h. System Managers are responsible for:
  - (1) Managing the system's life cycle process and products within their program(s) in compliance with Agency and Federal policy.
  - (2) Preparing System Management Plans and other decision papers.
  - (3) Obtaining review and approval of all decision papers.
- i. The Office of Acquisition Management and the Office of Grants and Debarment are responsible for ensuring that

this policy is incorporated, as appropriate, in Requests for Proposals, contracts, interagency agreements, cooperative agreements, and grants.

- j. Each EPA employee engaged in system life cycle management activities is responsible for conforming to this policy, and related procedures and standards.

7. DEFINITIONS.

- a. "Agents of EPA" refers to anyone who is directed to use EPA resources.
- b. "Applications system" refers to an information system composed of one or more units of software supported by automated data processing equipment (ADPE) and automating the work methods and procedures to collect, store, process and disseminate information to support specific agency missions.
- c. "Application systems life cycle management" is the process of administering an application system over its entire life cycle, from the time span between the establishment of a need for a system to the end of its operational use. The life cycle is divided into discrete phases with formal milestones established as points of management controls.
- d. "Appropriate level of management" is the first level of management whose scope of responsibility includes the Agency major user and funding organization(s). For example, if a system is used or funded by multiple AAships and/or Regions, those AAs and RAs sponsoring the project and the Executive Steering Committee for

IRM are the appropriate level of management. If its use and funding is restricted to one organization, that organization's manager is the appropriate level of management.

- e. "Decision papers" describe system activities which require management approval. The complexity and formality of the decision papers should be appropriate to the system's category.
- f. "Decision points" refer to specific points in a system's life cycle. The generic decision points in a life cycle are at the junctures between each of the six stages identified in the generic life cycle.
- g. "Decision Threshold" refers to the level of system review and approval authority required for system decisions as determined by the category of information system.
- h. "Guidance" refers to a recommended approach that promotes compliance with policies and procedures. It includes hints, examples, and lessons-learned.
- i. "Information" refers to any communication or reception of knowledge (e.g., facts, data or opinions) in any medium or form, including textual, numerical, graphic, cartographic, narrative or audiovisual forms.
- j. "Information Application System" refers to the organized collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures. Models are included in this definition.
- k. "Information resources management activities" refers to planning, budgeting, organizing, directing, training, and administrative control associated with government information resources. The term encompasses both information itself and the related resources, such as personnel, equipment, funds, and information technology.
- l. "Information system category" refers to the manner in which systems are classified according to a combination of factors including the system's type, cost, and organizational scope in terms of use and funding. All systems are categorized in one of the following four categories:

- (1) Major Agency Systems;
- (2) Major AAShip/Regional Systems;
- (3) Significant Program Office Systems;
- (4) Local Office or Individual Use Systems.

See Exhibit 17-A for the specific thresholds which determine a system's category.

- m. "Major information system" refers to a system that requires special continuing management attention because of its importance to an agency mission; its high development, operating or maintenance costs; or its significant impact on the administration of agency programs, finances, property, or other resources.
- n. "Mission critical" refers to a system whose operation is essential to the organization's mission.
- o. "Procedures" refer to instructions on how to perform work in order to meet the established standards. They should explain in detail the method to complete a task or job. Forms and work flows are considered procedures.
- p. "Standards" refer to the measures by which implementation of policy can be determined. They provide a basis of comparison, and are objective, clear, concise, technical descriptions. They are usually determined externally (e.g., Federal Information Processing Standards).
- q. "System" refers to an organized set of functions, data, procedures, hardware, software, communications and/or documentation which enables an organization to solve a specific information management problem. A system need not be automated, but most instances of life cycle management apply to automated systems.
- r. "System Charter" documents the information management problem to be resolved, the scope of the problem in terms of the user, sponsoring and funding organization(s), the time frame, the likely system category, the appropriate level of management for review and approval, and manager of the system.

- s. "System development or enhancement project" refers to the creation of new systems, enhancement of an existing system, or perfective, adaptive, corrective maintenance of an existing system, for which the estimated cost would exceed \$100,000. A system development or enhancement project typically encompasses all eight stages of the generic information system life cycle.
- t. "System life cycle" refers to the complete time span of a system from the origin of the idea that leads to the creation of the system to the end of its useful life. The stages of the life cycle are as defined in section 5.c. of this policy. There is obviously variance in life cycle periods among systems. To calculate total life cycle costs, a defined life cycle period needs to be established for each system development/modification project. Twelve years is cited in a number of references as an average system life cycle period.
- u. "System life cycle costs" refers to sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred, or estimated to be incurred, in the design, development, production, operation, maintenance, and support of a system over its anticipated useful life span. Costs include but are not limited to equipment, software, personnel (both Agency and contractor), timeshare, and telecommunications.
- v. "System life cycle methodology" refers to the formal documentation of the phases of an information system, beginning with the initiation through to the retirement phase. The methodology describes the precise objectives for each phase and the results required for each phase before the next one can commence. It may provide specialized forms for the presentation of the documentation throughout each phase.
- w. "System Management Plan" (SMP) is the key document which provides the overall framework for the management of the system. Basic components of the SMP are addressed in Section 5.f(2) of this policy.
- x. "System sponsor" refers to the manager of any EPA organizational unit which funds an information system. Generally, the system sponsor will be the same as the appropriate level of management for decision paper approval.

8. PROCEDURES, STANDARDS AND GUIDANCE. The Office of Information Resources Management will issue procedures, standards and guidance for Agency system life cycle management under separate cover. Other relevant Federal and Agency guidance documents which should be followed are noted below:
- a. FIPS PUB 38, Guidelines for the Documentation of Computer Programs and Automated Data Systems, February 15, 1976.
  - b. FIPS PUB 64, Guidelines for Documentation of Computer Programs and Automated Data Systems for the Initiation Phase, August 1, 1979.
  - c. FIPS PUB 65, Guideline for ADP Risk Analysis, August 1, 1979.
  - d. FIPS PUB 73, Guidelines for Security of Computer Applications, June 30, 1980.
  - e. FIPS PUB 101, Guidelines for Life Cycle Validation, Verification and Testing of Computer Software, June 6, 1983.
  - f. FIPS PUB 102, Guideline for Computer Security Certification and Accreditation, Sept. 27, 1983.
  - g. FIPS PUB 105, Guidelines for Software Documentation Management, June 6, 1974.
  - h. FIPS PUB 106, Guidelines on Software Maintenance, June 15, 1984.
  - i. FIPS PUB 124, Guideline on Functional Specifications for Database Management Systems , Sept. 30, 1986.
  - j. OMB Circular 94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, October 29, 1992.
  - k. OMB Circular 109, Major Systems Acquisitions, April 5, 1976.
  - l. EPA Information Technology Architecture Road Map.

Exhibit 17-A

SYSTEM CATEGORY	THRESHOLD CRITERIA (System category is determined by the highest threshold reached under either the scope <u>OR</u> cost criteria.)		SYSTEM MANAGEMENT PLAN(SMP) MUST BE REVIEWED BY:
	Scope	Cost	
1. Major Agency System	Mission Critical for Multiple AAships or Regions; or Agency Core Financial System	>\$25 million throughout the lifecycle or \$5 million annually	Funding Org. AA/RA, Dir. OIRM, Exec. Steering Comm. for IRM.
2. Major AAship or Regional System	Mission Critical for 1 AAship or Regional Office	>\$10 million throughout the lifecycle or > \$1 million annually	Funding Org. SIRMO(s) & AA/RA
3. Significant Program Office System	Mission Critical in Program Office	>\$2 million throughout the lifecycle or >\$100,000 annually	Funding Org. SIRMO(s)
4. Local Office or Individual Use System	Systems Below Category 3 Thresholds	<\$100,000 annually for one project	SIRMO or official designee