# Software Engineering Methodology

## Chapter 1.0
## Introduction

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*Chapter:*          **1.0**
                    **Introduction**

*Description:*      The *Department of Energy Software Engineering Methodology* provides guidance
                    for software engineering, project management, and quality assurance practices
                    and procedures.  The primary purpose of the methodology is to promote the
                    development of reliable, cost-effective, computer-based software products while
                    making efficient use of resources.  Use of the methodology will also aid in the
                    status tracking, management control, and documentation efforts of the project.

                    This software engineering methodology is consistent with other methodologies
                    used in the Government and private industry.  It complies with Departmental
                    policy on project management, configuration management, security, and records
                    management.  Significant input for the methodology was obtained from software
                    management programs at sites and organizations throughout the Department.  The
                    methodology integrates Departmental best practices and focuses on the quality of
                    both the software engineering process and the work products generated from the
                    process.

                    The software engineering methodology is derived from the principles and
                    standards advocated by software quality industry leaders, such as The Institute of
                    Electrical and Electronics Engineers and the Carnegie-Mellon Software
                    Engineering Institute (SEI).  This methodology is designed to enable project
                    teams to fully achieve Level 2 maturity on the SEI Capability Maturity Model.
                    Some Level 3 key process areas are also incorporated into the methodology.

                    Software quality assurance is integrated into the software engineering
                    methodology, making quality the responsibility of all project team manager(s)
                    and members.  To assure the development of quality software products, the
                    methodology prescribes reviews, inspections, and audits for the lifecycle
                    processes and technical work products.  To protect the integrity of the software,
                    the methodology also prescribes configuration controls over software, data, and
                    technical documentation.

                    The software engineering methodology encompasses all aspects of the software
                    lifecycle from project planning through production and maintenance, and
                    integrates the following basic lifecycle management concepts.

                    •          Implementation of software engineering preferred practices using a graded
                               approach based on the level of effort, complexity, and degree of external
                               impact of the software product.

*Description,*

*continued:*      •      Implementation of a project management methodology including quality
                         assurance, configuration management, and a comprehensive testing
                         approach that is adaptable to the individual site environments.

                  •      Application of a complete documentation approach supporting both
                         lifecycle and project management activities, to assure an effective method
                         for managing, tracking, and evaluating software engineering activities.

The software engineering methodology is intended to be used by individuals,
project teams, and managers who are responsible for developing a new computer-
based software product or make changes to an existing system.  The methodology
will be reviewed on a regular basis and modified as needed to keep pace with the
changing needs of the Departmental software engineering environment and the
continuing technical advances in the information systems industry.

The following sections provide additional information about using this software
engineering methodology.

1.1      Implementation of Methodology
1.2      Submitting Change Requests

*Section:*           **1.1**
                     **Implementation of Methodology**

*Description:*       This methodology integrates software engineering, project management, and
                     quality assurance practices and is designed to be flexible. It can be adapted to
                     accommodate the specific needs of any software project and all computing
                     platforms used in the Department including standalone and networked
                     mainframes, minicomputers, and microcomputers.

                     Projects that were initiated prior to the publication of this document should plan
                     to implement the methodology at the earliest feasible stage or the next release of
                     the product.  If a Project Plan already exists, make the revisions necessary to
                     integrate the software engineering, project management, and quality assurance
                     practices, as appropriate.  If a Project Plan does not exist, develop a plan that
                     summarizes the activities and deliverables of the previous stages and incorporates
                     the methodology activities and products into the subsequent stages.

                     The software engineering methodology presented here does not supersede,
                     replace, or override more stringent requirements that may apply to specific
                     projects such as scientific and technical practices, and security and safety issues
                     associated with the Nuclear Weapons Complex.

                     Since the methodology does not provide specific guidance for every software
                     engineering situation, suggestions for adapting the methodology to accommodate
                     projects of varying size, complexity, or criticality are provided in *Chapter 2.0,
                     Lifecycle Model.*

*Questions:*         If specific questions are generated concerning the interpretation or applicability of
                     portions of the methodology, the project team should attempt to resolve them
                     during the project review activities built into the stages of the lifecycle.  The
                     system owner/user(s) and other project stakeholders must concur with any
                     adaptations that are made.

                     When questions about interpretation or applicability of the guidance to a specific
                     project cannot be resolved by the project team, the issue should be submitted to
                     the site authority for software engineering, such as the site Information Resources
                     Management or Information Management organization, for resolution.  For
                     Headquarters projects, the Office of Information Management is the site
                     authority.

*Questions,*
*continued:*          Questions and issues will be analyzed by the site Information Management
                     Division and a response will be made in one of the following ways.

•            An immediate solution is determined and will be provided to the project
             team.

•            The issue will be submitted to personnel who are considered experts in the
             area in question.  Once a solution is reached, it will be provided to the
             project team.

It is important to also submit questions of interpretation or applicability and the
site-specific resolution to the Headquarters Office of Information Management.
The Office will determine if a modification to the *Software Engineering
Methodology* is needed to clarify processes or to provide additional adaptation
suggestions.  A central clearinghouse for all questions and resolutions will ensure
that needed changes to the methodology can be identified and implemented in a
timely and consistent manner.

*Section:*                **1.2**
                          **Submitting Change Requests**

*Description:*            The Departmental software engineering environment is continuously changing as
                         emerging technologies are integrated into projects, system owner/user
                         requirements are expanded, and organizational needs evolve.  The software
                         engineering methodology will be expanded and revised, as needed, to reflect
                         changes in the environment, improvements suggested through user feedback, and
                         the maturation of software engineering capabilities.

                         Users of the methodology are encouraged to submit suggestions for improving its
                         content and to report any practices that are difficult to understand or create an
                         implementation problem for a project team.

                         Suggestions and problems should be submitted on the Change Request Form that
                         is provided at the end of this section.  If the form is not available or does not
                         accommodate the type of request being made, submit a memo that describes the
                         suggestion or problem.

                         The Change Request Form or memo should be submitted to the Office of
                         Information Management at Headquarters in Germantown, Maryland.  The
                         Change Request should be submitted through the site's Information Management
                         organization.  All requests will be evaluated and the originator of the request will
                         be notified of the action taken.

                         Some requests will be handled immediately while others may require
                         investigation by an ad hoc Working Group of knowledgeable personnel.  In some
                         cases, a request may not be appropriate for the current environment, but will be
                         retained for future consideration.

| Software Engineering Methodology<br>Change Request Form | |
|---|---|
| **To be completed by Requestor** | **To be completed by Analyst** |
| Name: | Name: |
| Phone: | Phone: |
| Location: | Location: |
| Date: | Date Assigned: |
| Document Section: | Request Number: |
| Requested Change and Justification: | Change Classification Data (check one)<br><br>Class I Change ___<br><br>Class II Change ___<br><br>Class III Change ___<br><br>Summary of Impact: |
| Check if additional pages are attached ___ | Check if additional pages are attached ___ |
| Change Impacts<br><br>Section Number: _____<br><br>Pages: _____ | Change Impacts<br><br>Section Number: _____<br><br>Pages: _____ |

**Working Group Actions**

Approval/Disapproval Reason(s):                                                                    Date _____

Additional Comments:

| Software Engineering Methodology Change Request Instructions | |
| --- | --- |

| **Requestor's Section** | **Instructions** |
| --- | --- |
| Name:<br>Phone:<br>Location:<br>Date: | Fill in your name, telephone number, location and date. |
| Document Section: | List the document section where you want to make a change. |
| Requested Change and Justification: | State the change that you want to incorporate and state your reasons for the change. Attach additional pages as needed. |
| Change Impacts: | List any section numbers and pages that will be affected by the proposed change. |

\*\*Send the completed Change Request Form to the Headquarters Office of Information Management, Systems Engineering Group, Engineering Services Team, HR-433, Germantown, Maryland.

| **Analyst's Section** | **Instructions** |
| --- | --- |
| Name:<br>Phone:<br>Location:<br>Date Assigned: | Fill in your name, telephone number, location, and date you received the assignment. |
| Request Number: | Obtain the sequential number that will be used to track the request from the Headquarters Office of Information Management, Systems Engineering Group, Engineering Services Team, HR-433. |
| Change Classification Data: | **Class I Changes** in policy, procedures, required actions, or deliverables are defined by Government units (Congress, Office of Management and Budget), or by DOE policies, procedures, and administrative requirements.  These changes must be reviewed and approved by HR-433 and incorporated into the methodology with the next update. |
| | **Class II Changes** in technology or development methodology are descriptions of innovations in the way software products are developed.  These changes require review and concurrence by a Working Group and must be approved by HR-433.<br><br>Changes in required deliverables may be implemented by HR-433 or recommended by a Working Group.  The impact on the remainder of the methodology when such changes are incorporated require review and concurrence by a Working Group and approval by HR-433. |
| | **Class III Changes** in factual information (security requirements), wording, or corrections of typographical errors will be implemented as soon as possible to keep the methodology accurate and current.  Corrections of typographical errors are implemented without review.  All other changes require review and approval by HR-433. |
| Summary of Impact: | State what effect the proposed change would have on other sections of the document or the methodology. |
| Change Impacts: | List any section numbers and pages that will be affected by the proposed change. |

| **Working Group** | **Instructions** |
| --- | --- |
| Approval/Disapproval Reasons: | State whether the proposed change should be approved or disapproved.  Give reasons for the decision.  Indicate date of approval/disapproval. |